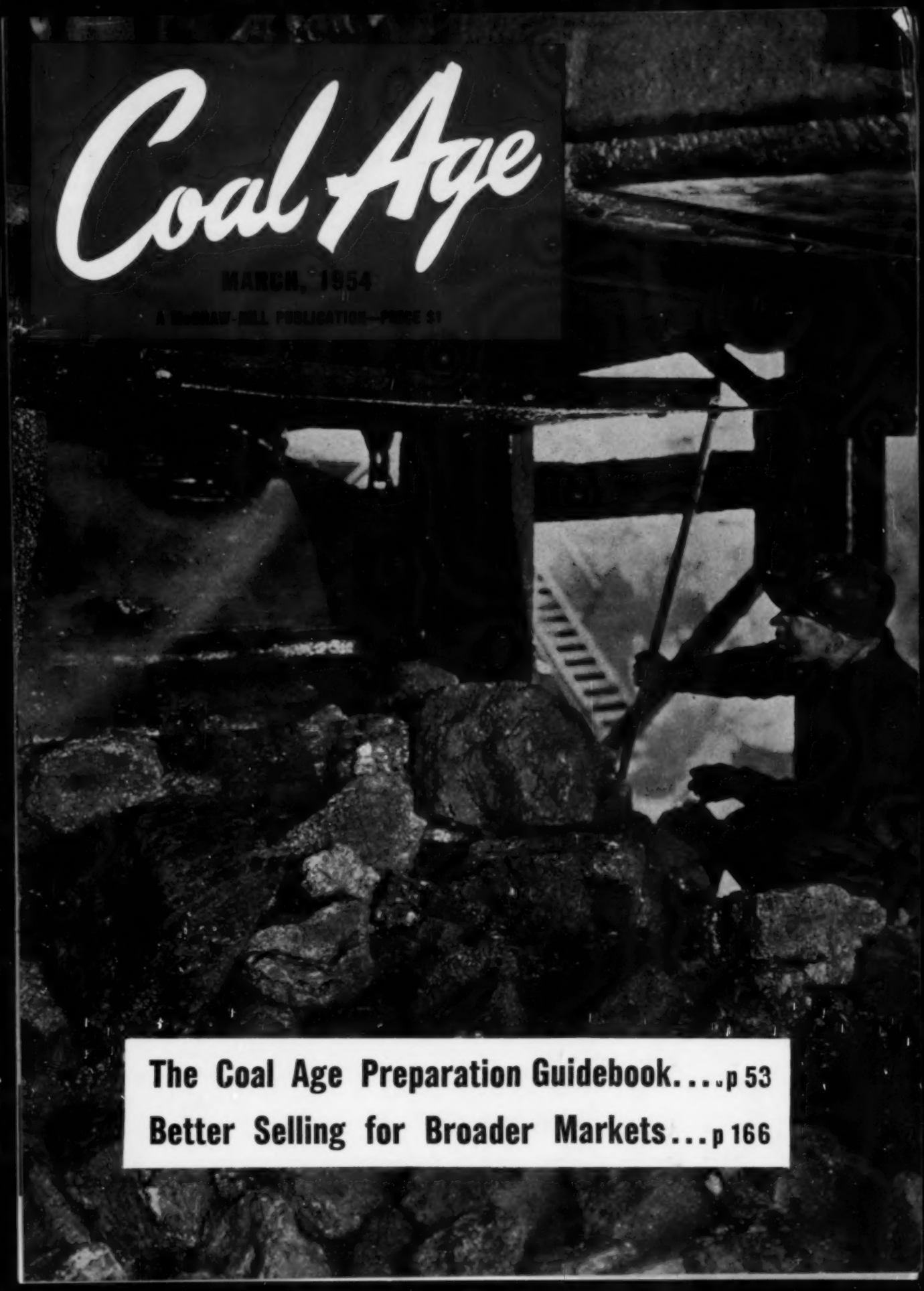


Coal Age

MARCH, 1954

A McGRAW-HILL PUBLICATION—PRICE $1

The Coal Age Preparation Guidebook....p 53

Better Selling for Broader Markets...p 166

Dependability

that puts Money in the till



Naturally, any breakdown in your coal haulage system can quickly cost real money. It is to avoid this that more and more mine operators put their investment in the dependability of A.C.F. Mine Cars.

Here are some of their own reasons for this decision...

1. Exclusive Drop Bottom Design cuts unloading to a few seconds.

2. Simplicity of overall design means that on-the-spot repairs are practical. Switched to a siding for repairs, A.C.F. Mine Cars *can't* stop production.

3. Versatility...the use of mine cars to take men and materials in... coal out! Two payloads instead of one!

This is merely the beginning. Ask your nearby A.C.F. Representative to give you all the details pertinent to your particular installation! Get these facts before you buy. You'll be glad you did.

American Car and Foundry Company, New York · Chicago · St. Louis
Cleveland · Philadelphia · Huntington, W. Va. · San Francisco
Washington · Berwick, Pa.

a.C.f.

MINE CARS *for Constant Haulage*

B. F. Goodrich Grommet belts last 20 to 50% longer, yet cost no more than ordinary V belts

Save 3 ways

Here's how you can make a 3-way saving with B. F. Goodrich Grommet V belts. First, you save on replacement costs because Grommet V belts last 20 to 50% longer. You save on production costs because machines keep running with fewer interruptions. And you save on maintenance costs because these V belts need less attention. Here are the basic reasons BFG Grommet belts outlast and outperform ordinary V belts.

Strongest V belt made

All of the load-carrying cords in Grommet belts are concentrated in twin grommets. These grommets are cord loops, made like giant twisted cables except that they're endless. Since there are no center cords, the Grommet belt is more flexible, and so can "give" temporarily and absorb shock loads. As a result, Grommet belts last 20 to 50% longer, depending on the service. (The more severe the service, the greater the increase over ordinary belts.)

No weak spots

The section where cords overlap is the weak spot in ordinary belts. That's where 80% of V belt failures occur. But in Grommet V belts this cause of belt failure has been eliminated. The grommets are endless. There are no splices or overlaps—no weak spots to cause premature belt failures.

⅓ more grip

Grommet V belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip sheaves better. Size for size, Grommet belts give ⅓ more gripping power with less slip, pull heavier loads with a higher safety factor. And because there is less slip, there is also less surface wear.

Less stretch

In ordinary belts under tension, the center cords loaf, the outer cords overwork because tension is greater near the driving faces. Grommet belts, with no center cords, have much more strength and less stretch. Grommet belts stretch, on an average, only about ⅓ as much as ordinary belts.

They cost no more

Grommet V belts were developed by B. F. Goodrich to give V belt users more for their money. No other belt will stand so much punishment or last so long. Yet the savings they can make for you will be clear profit because Grommet belts cost not one cent more than ordinary V belts.

Send for proof today

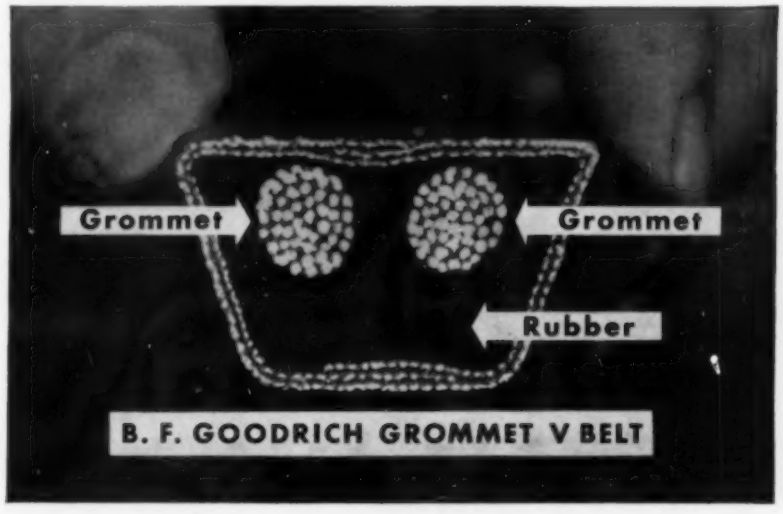
Ask your local B. F. Goodrich distributor or send the coupon for a set of reports telling users' experiences and showing actual installations where Grommet V belts have outlasted all others.

Grommet—T. M. The B. F. Goodrich Co.

***Grommet V-Belts* BY**

B.F. Goodrich

INDUSTRIAL PRODUCTS DIVISION



The B. F. Goodrich Company
Dept. M-191
Akron, Ohio

☐ Send set of reports telling users' experiences and showing actual installations proving that B. F. Goodrich Grommet belts outlast all others.

☐ Have distributor show me the "X-ray" belt so I can see Grommet belt construction.

Name_____

Firm Name_____

Address_____

City_____ Zone_____

State_____

A JOB LIKE *this* CALLS



High on some swaying spire or stack you'll find the busy steeplejack; and there he does a job of paint where ordinary workmen ain't . . . How does he work so unafraid? He's a skilled specialist at his trade.

FOR *SPECIALIZED* SKILL

—and so does the job of lubricating coal mining machinery



Hulburt *Quality* GREASE

Hulburt Quality Grease successfully combats lubrication trouble in difficult places where ordinary lubricant ain't worth a whoop . . . because it is made by skilled specialists for its one particular and specialized job — namely, the proper lubrication of COAL MINING MACHINERY. This is a tough job, under tough conditions — but Hulburt Grease is unafraid to tackle it. When friction stacks up against Hulburt it hasn't got a chance.

HULBURT OIL & GREASE COMPANY, PHILADELPHIA, PA.

Specialists in Coal Mine Lubrication

EVERY STRAND, EVERY CORE gets extra protection...



TUNE IN:
METROPOLITAN OPERA
radio broadcasts
every Saturday afternoon.
See newspaper for
time and station.

TEXACO

TEXACO



WITH TEXACO CRATER your wire rope will stay strong longer. That's been the experience of operators everywhere. *Texaco Crater* is the *penetrating* lubricant that: 1) coats each metal strand with a tough, long-lasting wear- and rust-defying film; and 2) surrounds and preserves the hemp core, adding greatly to its life. You can count on *Texaco Crater* to bring down your wire rope maintenance costs.

On open gears, *Texaco Crater* also does an outstanding preventive maintenance job. It clings to the teeth, won't ball up or throw off . . . provides a cushion against shocks and heavy loads. Gears run more quietly, wear is greatly reduced.

For convenience in application, many operators prefer *Texaco Crater X Fluid.* It *goes* on (without heating) as a liquid, and *stays* on just like the regular *Crater.*

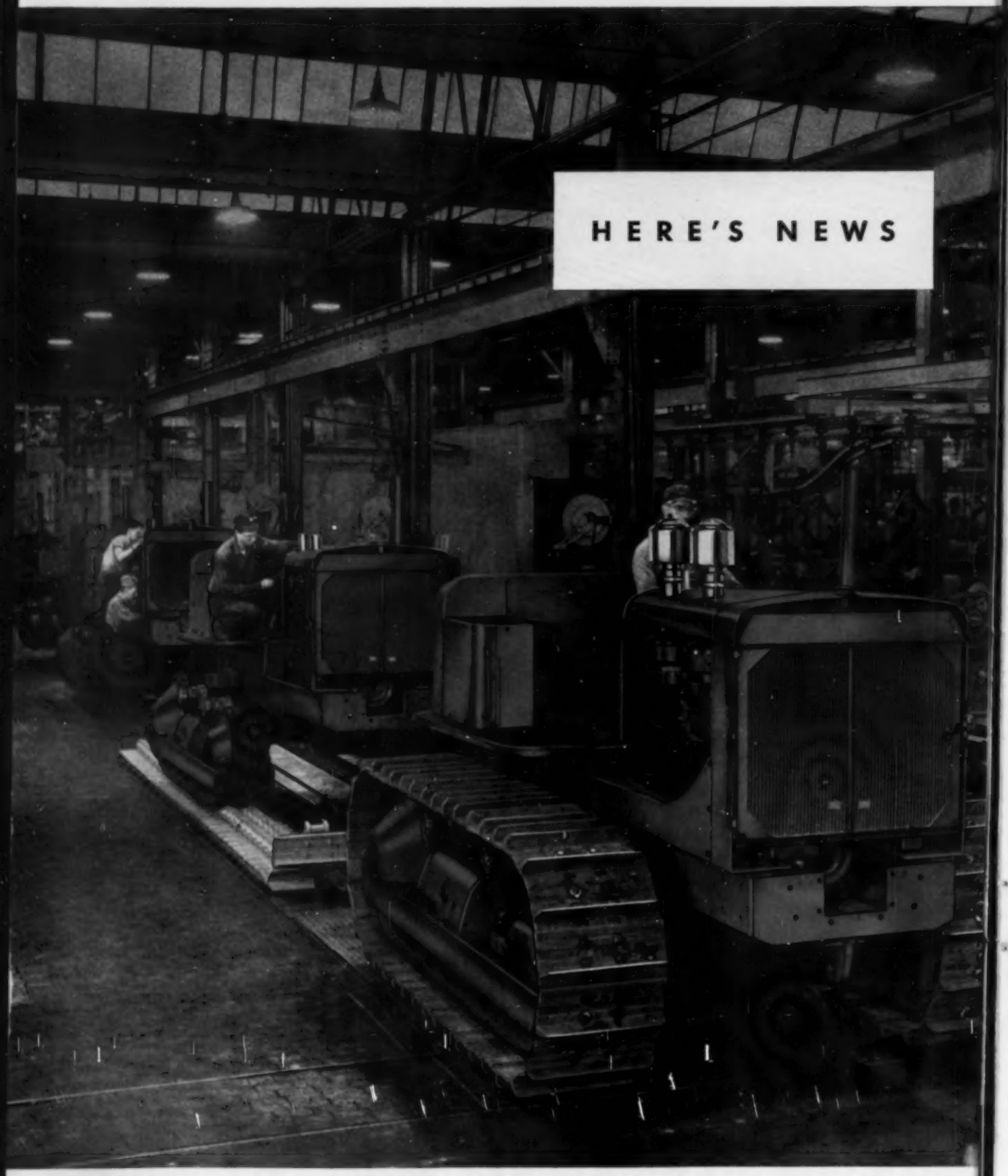
In mine car wheels, the lubricant to use is *Texaco Olympian Grease.* It assures easier starts, regardless of temperature, and gives all types of bearings longer lasting protection.

A Texaco Lubrication Engineer will gladly help you make savings through effective lubrication. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

LUBRICANTS for the Coal Mining Industry



They're here now! **28,000-lb. HD-15's with torque converter drive are already rolling off the assembly line.**

Allis-Chalmers Powerful HD-15 adds to its big work advantages

. . . now offers choice of two outstanding drives— standard transmission with time-saving shift pattern, or widely accepted hydraulic torque converter drive

From its introduction, the Allis-Chalmers HD-15 has set new standards in performance and long-life service . . . in a new size class. It combines outstanding strength and balance with plenty of power, plus a simplified, time-saving transmission that gives big work output. In addition, the HD-15 offers remarkable service simplicity, with features like unit assembly and 1,000-hour lubrication intervals for truck wheels, idlers, and support rollers. It has proved itself the kind of tractor required on today's jobs.

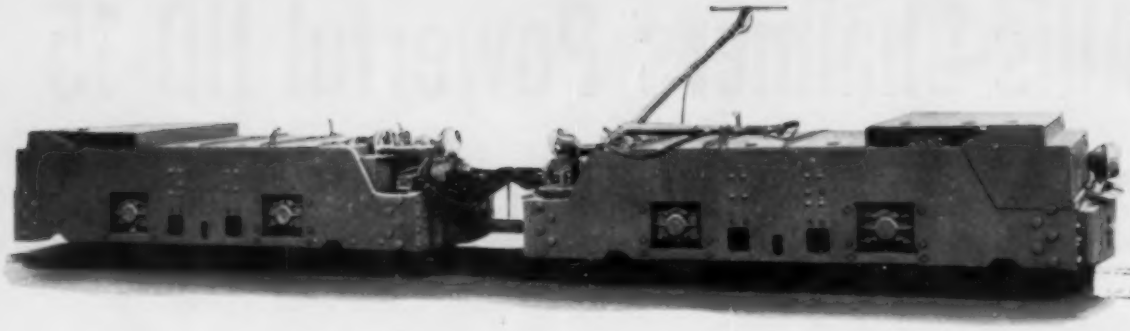
Now, hydraulic torque converter drive is added as optional equipment — an additional working advantage for the powerful HD-15. This advanced design drive was introduced by Allis-Chalmers in the world's *first* torque converter tractor nine years ago. This modern drive gets more done because it automatically provides the right combination of speed and pull every working minute . . . and hydraulic cushioning assures longer life for both tractor and auxiliary equipment.

Now you can choose the HD-15 with standard transmission *or* hydraulic torque converter drive. Either way you'll be getting the most advanced tractor in the business. Let your Allis-Chalmers dealer give you *all* the reasons why.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

TORQUE CONVERTER

Symbol of greater output, longer life.



For Heavier Duty Main Line Locomotives

Connect Your Single Units In *Tandem*

HERE'S HOW: Simply connect identical haulage locomotives in either permanent or separable Tandem units (see above). To do this you may require Controllers, Contactors, Power Brakes or other mechanisms to complete the job. Jeffrey can help you obtain adequate main line haulage for your mine. For an estimate of necessary details . . . call your nearest Jeffrey district office or direct an inquiry to Columbus. Do it today.

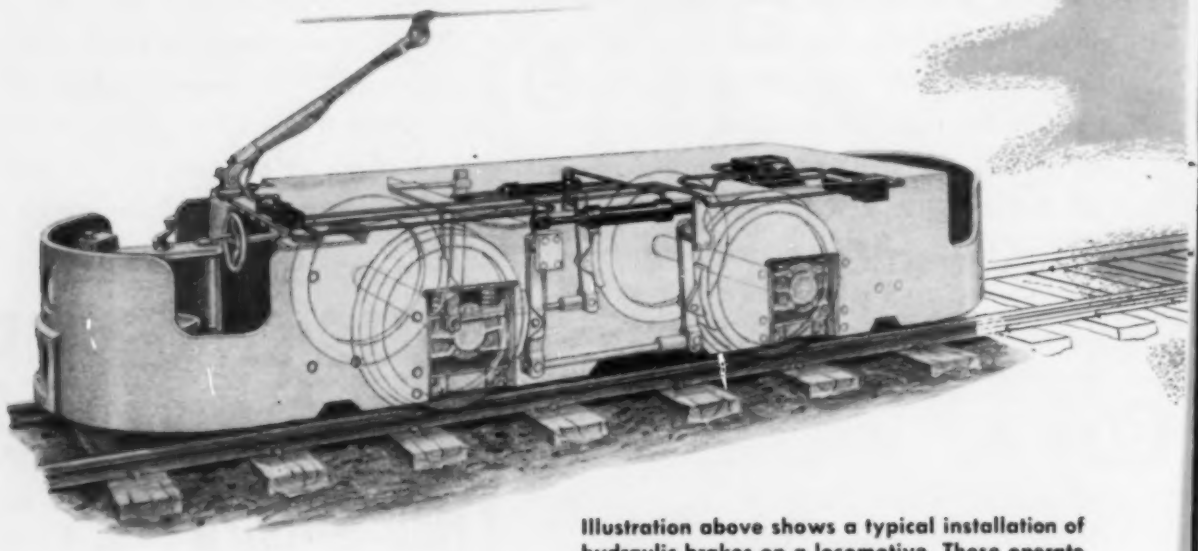
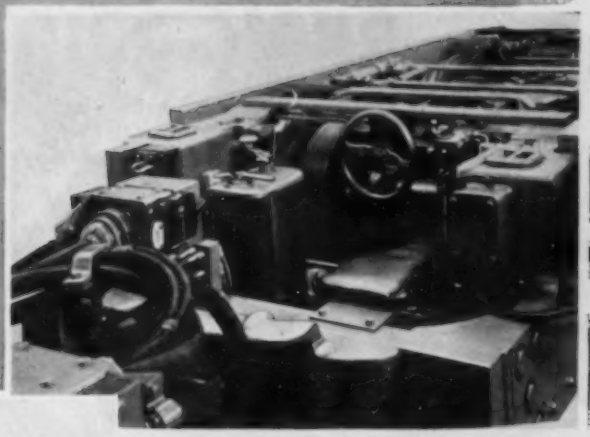
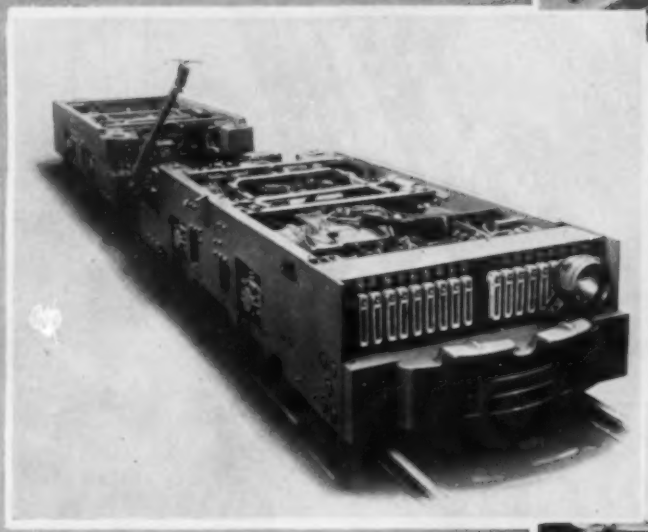


Illustration above shows a typical installation of hydraulic brakes on a locomotive. These operate on the same principle as the air brake but occupy about one-fourth the space. Installation is a simple matter.

Left — A 20-ton permanent Tandem unit utilizing two 10-ton locomotives. This makes a very desirable main haulage unit.

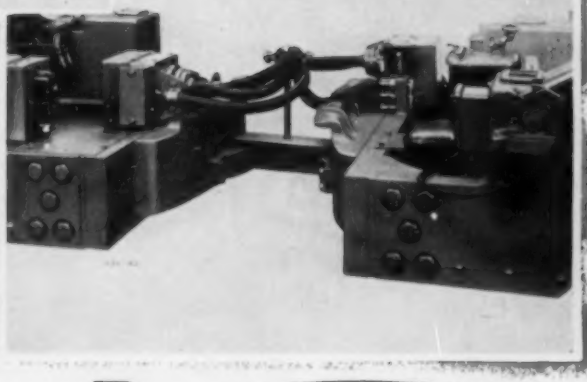
Right — A close-up view of the motorman deck in a tandem unit showing the control for the hydraulic brakes, the four-motor controller and installation of the electrical and hydraulic cross-connection. Air brakes are recommended, providing there is space available for installation of equipment.





Left — View of a permanent Tandem unit equipped with contactor control. Note bank of contactors in foreground.

Right — A close-up view of a typical permanent Tandem connection showing the drawbar, bumperettes, electrical and hydraulic brake cross-connections.



THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

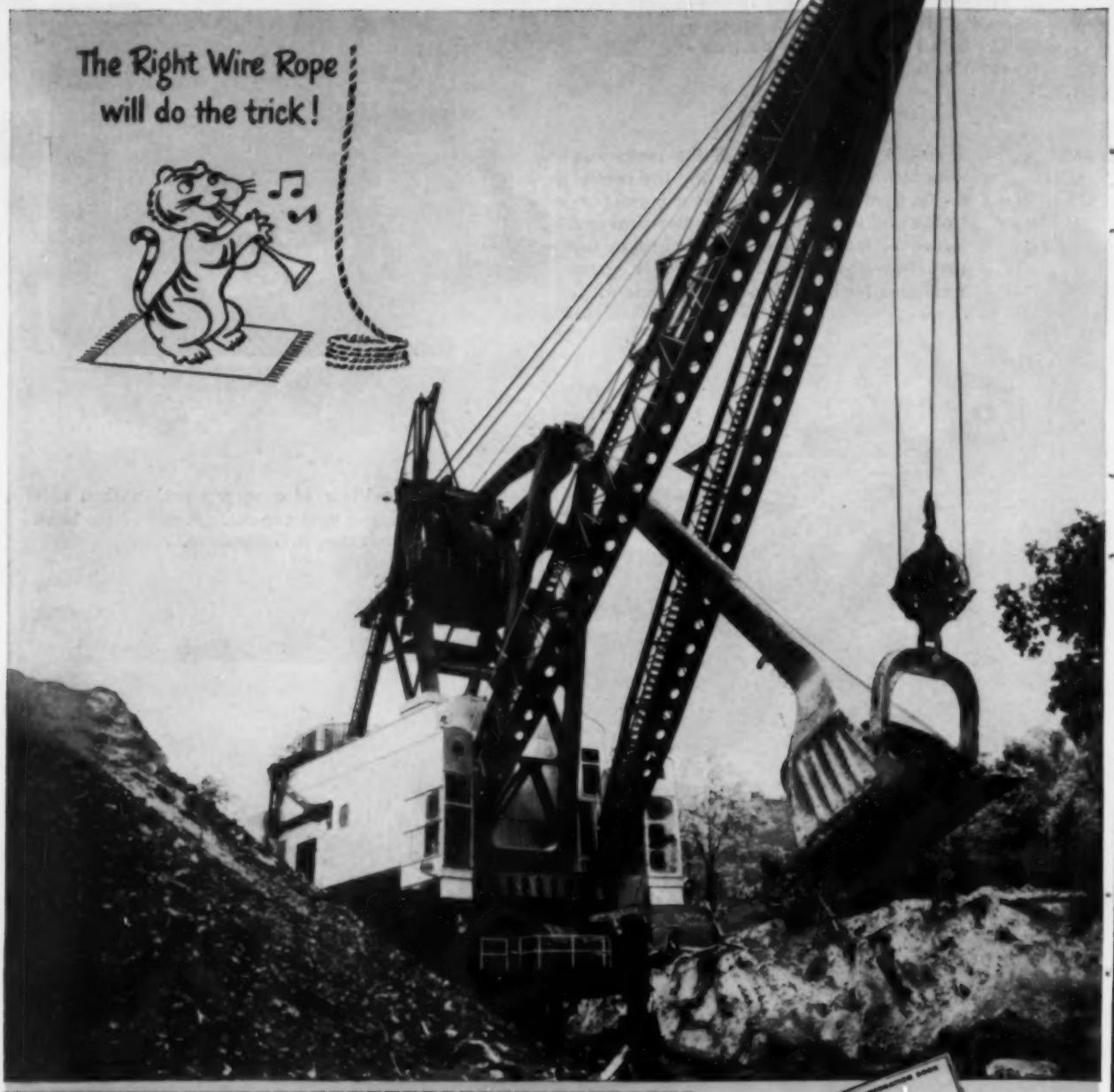
sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED

. . .IT'S A JOB FOR JEFFREY!

12,587 carloads of



American Steel & Wire
Room 842, Rockefeller Building
Cleveland 13, Ohio

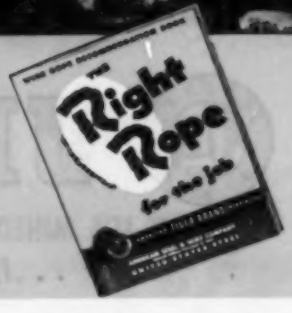
FREE ROPE BOOKLET →

Please send me, without obligation, a copy of your booklet, "The Right Rope for the Job," which lists the correct Tiger Brand Ropes to use for hundreds of typical applications.

Name.....

Address.....

City & State.....



overburden moved with one Tiger Brand Hoist Rope

IMAGINE 12,587 50-ton freight cars strung out end-to-end. They would make a train more than 80 miles long; and if each car was level full, the entire train would contain 1,000,000 cubic yards of material. That's how much overburden this big coal stripping shovel moved with one American Tiger Brand Hoist Rope.

Despite hard digging, a 2⅜" Tiger Brand Wire Rope lifted and lowered the fully loaded 45 cu. yd. bucket *20,000* times before it had to be replaced. This equipment is used by Central Ohio Coal Company which supplies coal for The Ohio Power Company's new Muskingum River electric power generating plant. This company also uses Tiger Brand Wire Rope on its 18 cu. yd. shovels.

You will like Tiger Brand, too. It lasts long in *any* type of service.

Send the coupon for our recommendations of the right rope to use on your machines.



Regular lubrication of sheaves helps prevent excessive wear of the Tiger Brand Ropes on these big machines.



This 18 cu. yd. electric shovel and the 45 cu. yd. job shown on the opposite page are stripping overburden 3 shifts a day *every* day at Central Ohio Coal Co.'s big Muskingum Mine near Zanesville, Ohio. Tiger Brand Rope is giving excellent service on both these hard-working machines.

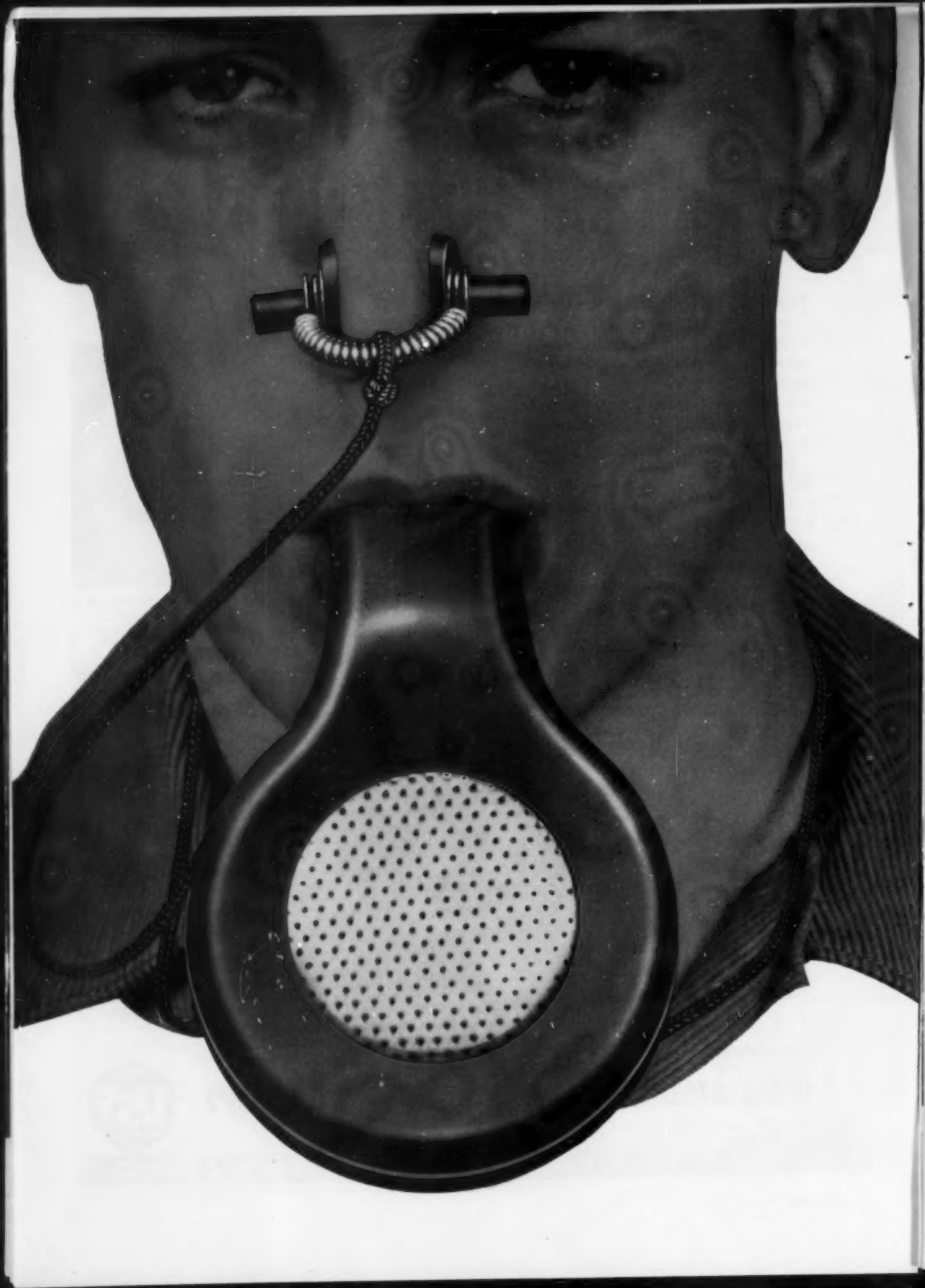
AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION
GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

USS

UNITED STATES STEEL



THE M·S·A SELF-RESCUER

dependable, instant breathing protection in emergencies—

When deadly after-damp is produced by fire or explosion, the M.S.A. Self-Rescuer gives the miner the precious minutes of breathing protection necessary to travel through carbon monoxide contaminated atmospheres to fresh air. The unit is compact, light in weight, and can be stored in quantity in small space or carried individually on the miner's belt. Its chemical cartridge is hermetically sealed against deterioration. Visual inspection of the seal is easily made. The cartridge is replaceable and provides economy for training programs.



SELF-RESCUER CACHE ASSEMBLIES

This assembly consists of six Self-Rescuers complete in a sturdy metal box. The Cache Assembly is ideal for storage anywhere in the mine, ready for instant use. Typical storage places are main haulage ways, man-trip cars, working sections, fresh air bases, and along belt lines.



SELF-RESCUER INDIVIDUAL CARRYING CASE

This new carrying case, made of reinforced plastic, is light in weight, and highly resistant to abrasion and acids. A rubber gasket assures maximum protection against dust and moisture. The unit fits neatly and securely on the belt, and its streamlined design prevents annoying snagging and catching on clothing or equipment. Opening of one snap-button releases the Rescuer for immediate use.

You're in immediate command of emergencies with **M·S·A** RESPIRATORY EQUIPMENT

M·S·A CHEMOX®

Complete breathing protection while traveling through any gaseous or oxygen deficient area. Generates its own oxygen supply from replaceable canister. Weighs only 13½ lbs. U. S. Bureau of Mines approved. Write for details.



M·S·A McCAA TWO-HOUR OXYGEN BREATHING APPARATUS

Under the hardest physical conditions so often required in fighting and sealing fires, re-establishing ventilation, and rescue operations, this apparatus gives the wearer complete breathing protection in any unbreathable atmosphere for a minimum of two hours. U. S. Bureau of Mines approved. Write for details.



M·S·A PNEOLATOR

Automatic artificial respiration that assures the maximum chances of recovery for those overcome by poisonous gases, electrical shock, or other causes of asphyxia. Accepted by the American Medical Association. Write for details.



M·S·A "ALL-SERVICE"® MASK

Safe, comfortable breathing protection against smoke, toxic gases including carbon monoxide singly or in combination where there is sufficient oxygen to sustain life. U. S. Bureau of Mines approved. Write for details today.

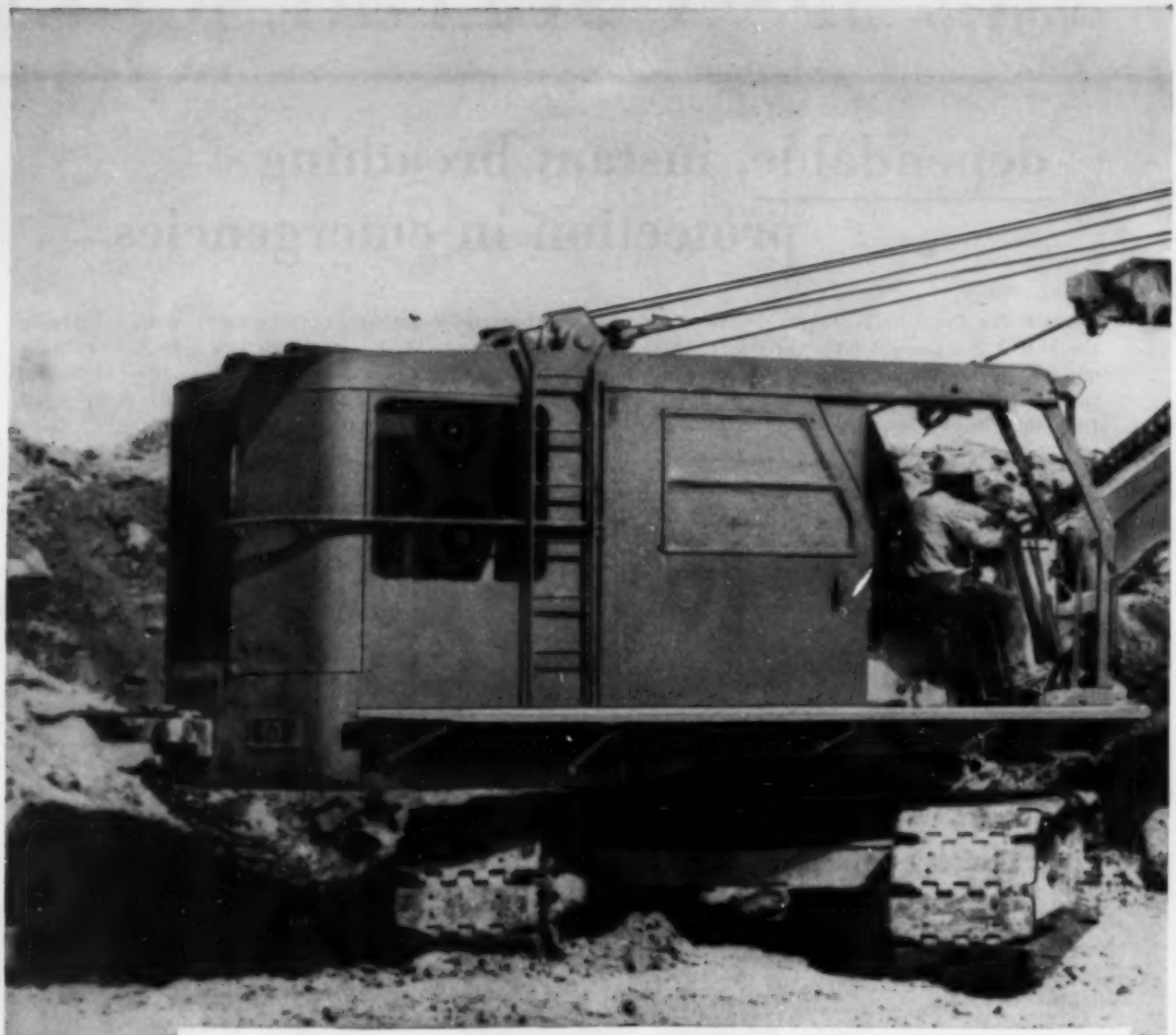


MSA
SAFETY EQUIPMENT HEADQUARTERS

When you have a safety problem, M.S.A. is at your service. Our job is to help you.

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 77 Branch Offices in the United States and Mexico

MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, New Glasgow, N.S.



MEASURE OUTPUT by "KOEHRING WORK CAPACITY"

With Koehring excavators and cranes you gain an important production advantage in extra work capacity. There are some very simple ways to check this. Take lifting capacities, for instance. The machine with the heaviest lift capacity not only picks up larger crane loads — it also has more stability and power to increase shovel, dragline and clamshell output. Be sure to check lift ratings, and other clear-cut measurements of "KOEHRING WORK CAPACITY" before you buy any excavator or crane. Your Koehring distributor has important figures to show you. See him soon.

K331

lift capacities up to 79½ TONS . . . ½ to 2½ YARDS dipper capacities

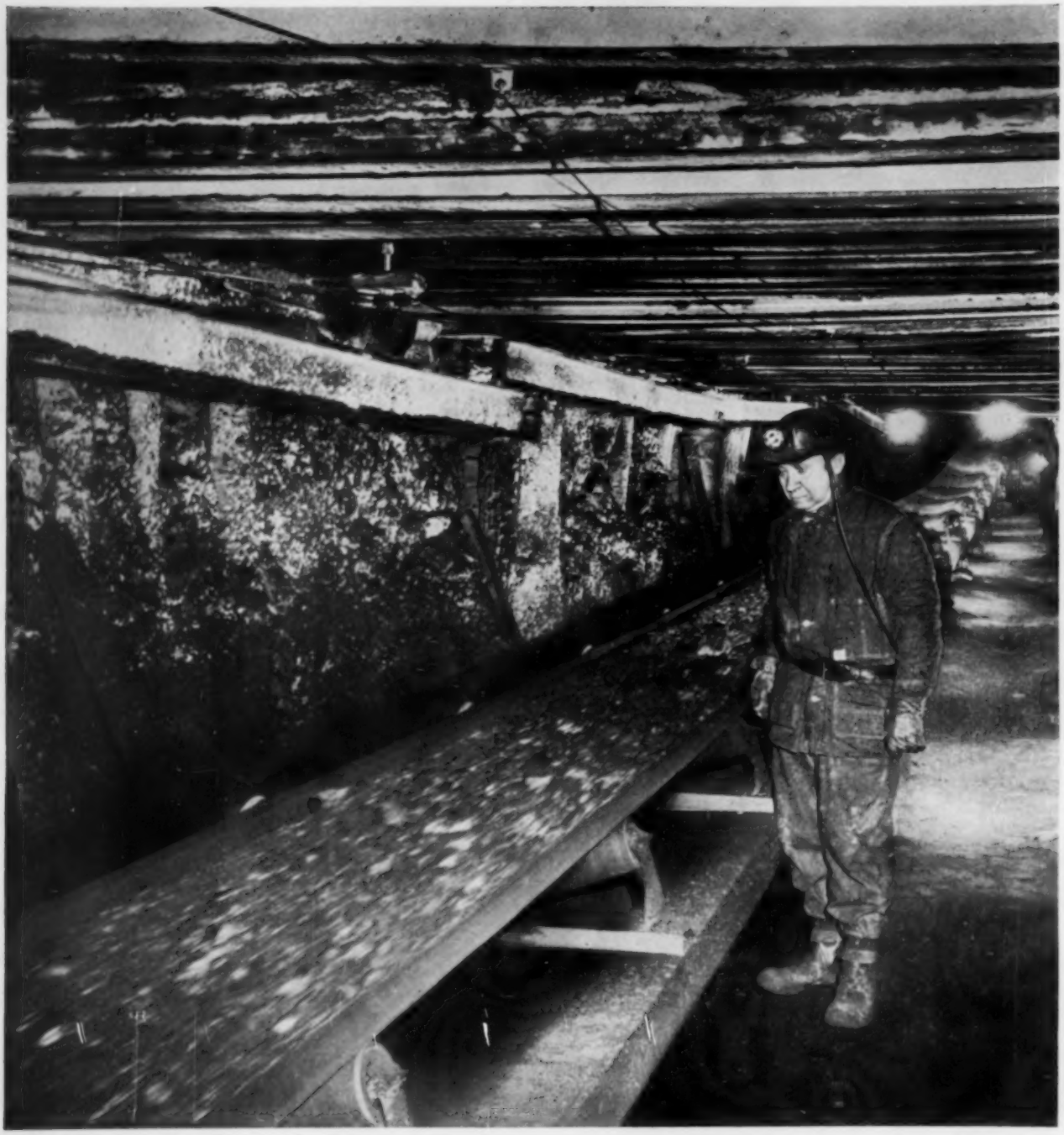


BIG-PRODUCTION TEAM — Loading out big-chunk rock, this Koehring 1½-yard shovel is teamed up with Koehring 6-yard Dumpters.® Fast-spotting Dumpters move in close, keep shovel swing short. Square 8 x 8-ft. body permits loading over side or end. No-turn shuttle hauling and instant gravity-dump speed haul cycles.

KOEHRING Company MILWAUKEE 16, WISCONSIN

Subsidiaries: Parsons • Kwik-Mix • Johnson

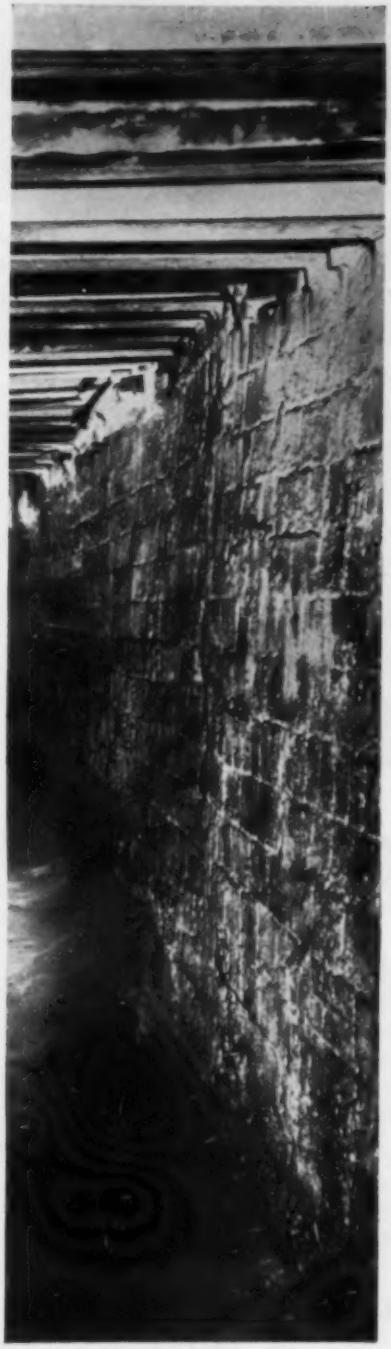
3½-Mile Conveyor System



HEWITT-ROBINS

EXECUTIVE OFFICES, STAMFORD, CONNECTICUT

Connects Face to Tipple



EQUIPMENT: 3½-mile long Hewitt-Robins Belt Conveyor System consisting of nine sections: six 30" standard heavy-duty underground mine conveyors, one 36" slope conveyor and two 36" surface conveyors.

LOCATION: Ebensburg Coal Company, Mine No. 1, Colver, Penna.

MATERIAL HANDLED: 12" maximum size, r.o.m. lump coal.

PERFORMANCE: This Hewitt-Robins Conveyor belt system handles coal at an average rate of 250 T.P.H. with peak loads running as high as 300 T.P.H. The six 30" underground conveyors operate at 400 F.P.M. and the 36" slope and surface conveyors, at approximately 350 F.P.M.

RESULTS: The performance of this installation has been quite satisfactory from the standpoint of both Operating and Maintenance Costs.

Engineering Data

MINE-TYPE SHUTTLE CONVEYOR: The answer to truly continuous mining . . . it follows the working face and at the same time maintains a fixed transfer point through a fixed tripper—unit is extendable and retractable up to 600'.

SECTIONALIZED MINE CONVEYORS: For main and panel entry haulage . . . available in 8', 10' and 12' sections with choice of 24", 26", 30", 36", 42" and 48" belt widths. Conveyor sections are selected to provide proper idler spacing to suit conditions.

ENGINEERED CONVEYORS: Designed to meet particular local conditions . . . available in belt widths from 16" to 72" . . . supplied with anti-friction idlers having 4" to 7" diam. pulleys. When required, 2½" offset, mine-type troughing idlers can be supplied where height limitations demand their use.

Here is a partial list of

HEWITT-ROBINS PRODUCTS

that will help you cut handling costs and increase operating efficiency.

MACHINERY

Belt Conveyors
Belt & Bucket Elevators
Car Shakeouts
Conveyor Idlers
Dewaterizers
Mechanical Feeders
Foundry Shakeouts
Mine Conveyors
Reclaiming Systems
Screen Cloth
Stackers & Trippers
Vibrating Conveyors & Screens

INDUSTRIAL RUBBER PRODUCTS

BELTING:

Conveyor
Elevator
Transmission

HOSE:

Acid
Air & Air Drill
Barge Loading
Dust Suction
Fire
Fuel Oil & Gasoline
Gasoline Pump
Mud Pump Suction
Oil Suction & Discharge
Propane-Butane
Road Builders'
Rotary Drilling
Sand Blast
Sand Suction
Sea Loading
Servall®, All-Service
Steam
Tank Car & Tank Truck
Vacuum & Air Brake
Water & Water Suction
Welding, Twin-Weld®

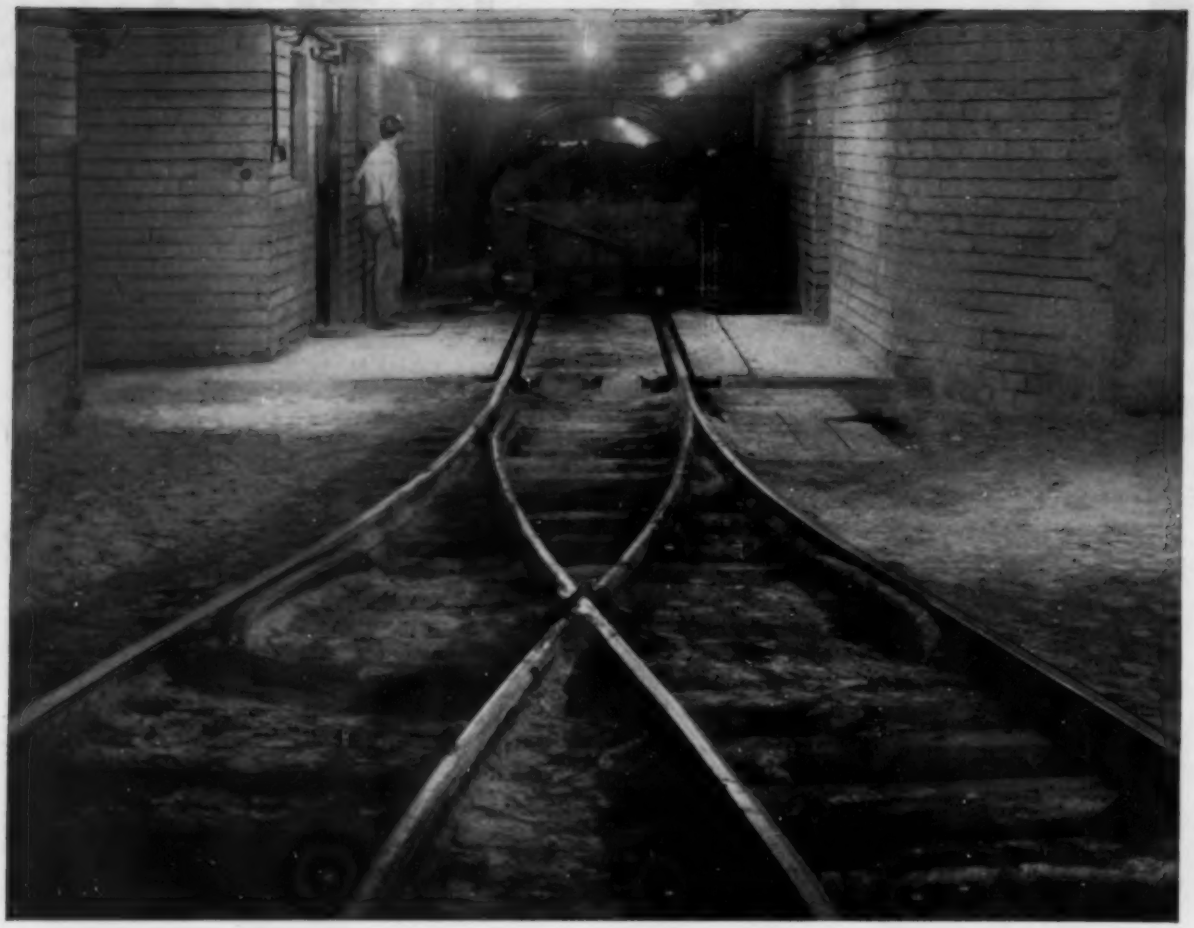
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For information and service on industrial rubber products, contact your Hewitt-Robins Industrial Supply Distributor. Through his complete stock of Hewitt-Robins Rubber products, and his familiarity with local field conditions, he can fill your supply needs promptly and correctly. See Classified Phone Book for the Hewitt-Robins Industrial Supply Distributor serving your area.

1428

INCORPORATED

DOMESTIC DIVISIONS: Hewitt Rubber • Robins Conveyors • Robins Engineers • Restfoam
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Now...Bethlehem Layouts to AMC Standards for Rail Heavier than 60 lb

As a step toward lowering the cost of mining, many mines are putting on larger capacity cars. And, of course, heavier rolling stock calls for heavy-duty haulage systems.

To help mines with this phase of modernization, Bethlehem now offers track layouts using rail heavier than 60 lb to American Mining Congress standards. These new designs include switches, frogs, closure rails, guard rails . . . even the tie-plates and frog-plates on which the track is laid. And Bethlehem is in position to give good delivery service on these heavy materials.

If you are re-appraising your trackwork, or contemplating the opening of a new mine, let a Bethlehem engineer sit in with you. With his many years of experience with mine-haulage problems, he can help you design a layout that will stand up for years to come. He will be glad to give you the full story on Bethlehem heavy-duty trackwork. Just drop a line to the nearest Bethlehem sales office.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM PREFABRICATED TRACK

THE SUPER 14-BU LOADER

Beats All Competition!



Here are the Figures...

Place: A large midwestern mine

Height of Seam: 56-58" Coal

Equipment: Joy Super 14-BU Loader, served by 3 Shuttle Cars

Time: 20 consecutive shifts of operation, as follows:

DATE	TONS LOADED
Oct. 30	785 tons
Nov. 2	786 "
" 4	810 "
" 5	841 "
" 6	911 "
" 9	837 "
" 10	779 "
" 11	793 "
" 12	788 "
" 13	827 "
" 16	709 "
" 17	718 "
" 18	752 "
" 19	797 "
" 23	732 "
" 24	771 "
" 27	708 "
" 30	812 "
Dec. 1	774 "
" 4	856 "
AVERAGE LOADED...	**...789 TONS/SHIFT**

Note again the results of the performance test described at the left: *average production for 20 consecutive operating shifts of 789 tons loaded per shift.* The low was over 700 tons per shift; the high over 900 tons—a remarkably consistent performance.

Just to clear up the point for you, the figures shown are actual tonnages reduced by 10% to allow for spillage and for possible errors in computing room widths. Another important point: the total delay time on the machine for all 20 shifts was only 35 minutes. Joy equipment stays on the job, keeps working—costs you less in down-time and requires less maintenance.

To sum it all up, Joy machines will do the best job for you in keeping costs down and production rates up—no matter what your seam conditions are. Let us work with you. ***Joy Manufacturing Company, Oliver Bldg., Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Ltd., Galt, Ont.*

Consult a Joy Engineer



JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

WAD-CL-5004

IF...YOU'RE MINING VERY LOW COAL...

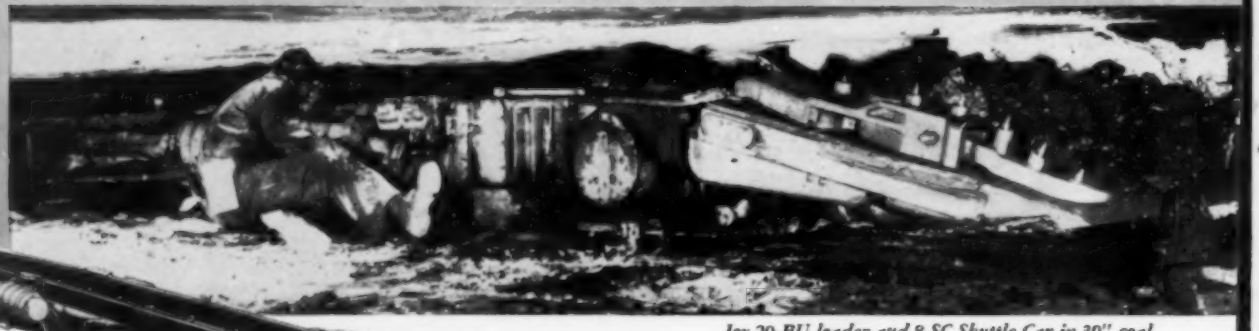




Joy 20-BU in 29" coal



FOR REAL HIGH CAPACITY PRODUCTION...



Joy 20-BU loader and 8-SC Shuttle Car in 30" coal



...use the best—the 20-BU LOADER

WRITE FOR BULLETINS, OR

Consult a Joy Engineer



The JOY 20-BU is only *24" high,* but its loading speed is up to 8 tons a minute!

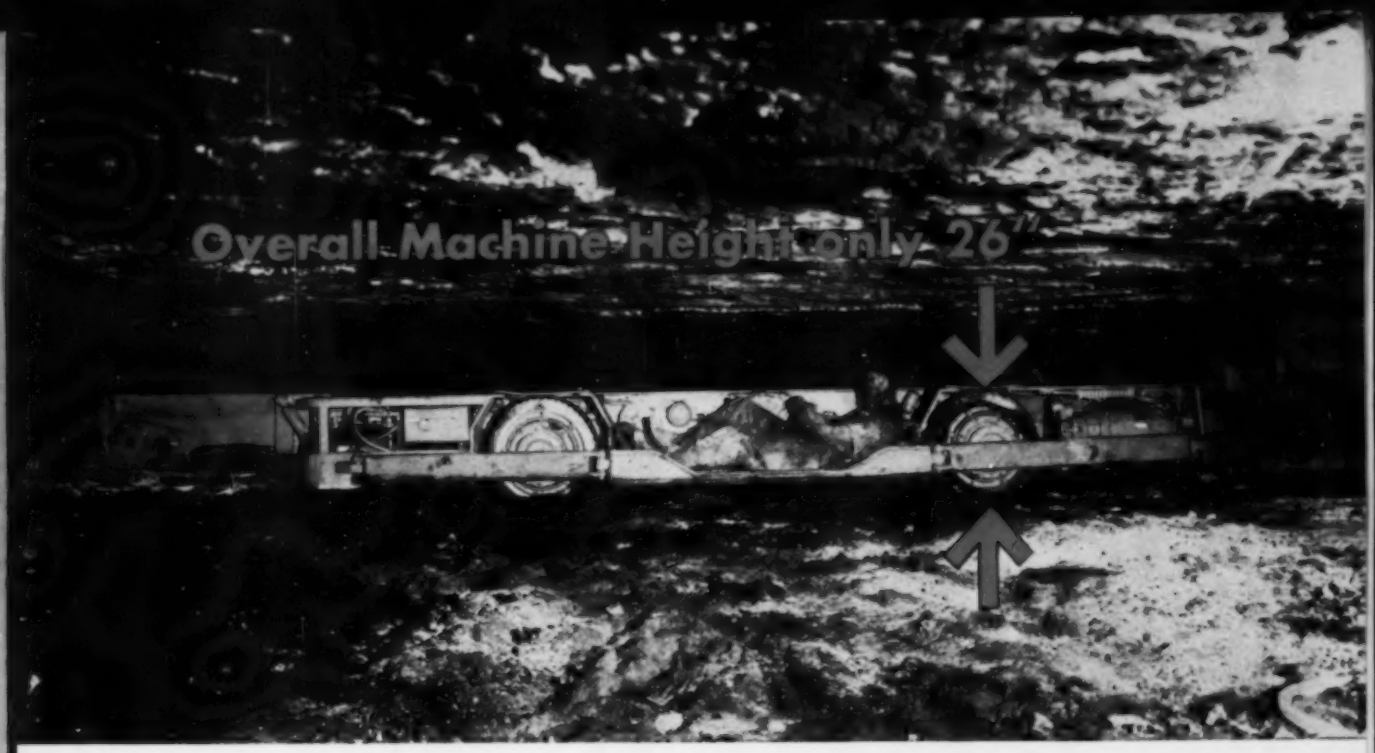
An exclusive feature of the 20-BU is the independent drive of the conveyor and gathering head. While a shuttle car is away, the gathering arms continue to operate and can provide a fully loaded conveyor ready for quick loading when the car returns. This independent drive also permits continued loading by the conveyor even if the gathering arms are momentarily stalled with hard digging.

The 20-BU is a field-proved, tried and true machine that is boosting production and profits in low vein coal mining everywhere. Let us show what it will do for *you!* ● ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

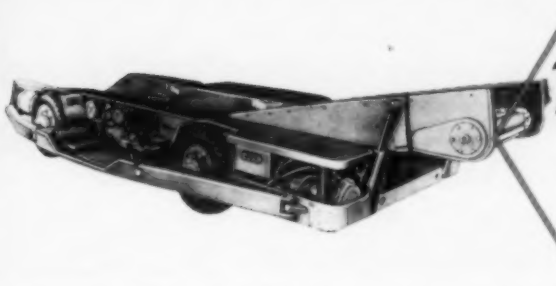
W&D CL 8068

JOY

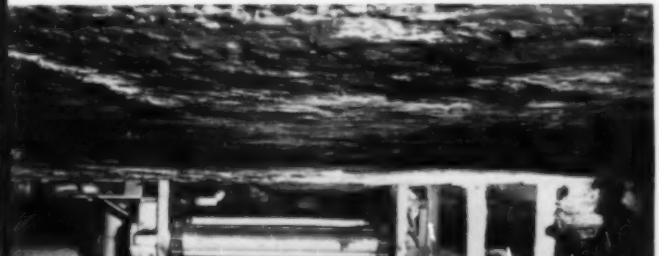
WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT



When you're looking for dependable, high-tonnage hauling in very low coal...



The 8-SC SHUTTLE CAR is YOUR VERY BEST BET!



Only 26" high, the 8-SC Shuttle Car has a level capacity of 2 tons. With the 12-RB Cutter (26" high) and the 20-BU Loader (24" high), it constitutes the first high-capacity mechanized mining team for very low coal. Other Joy equipment for any mining need.

The 8-SC is highly maneuverable and flexible—it loads, unloads and gets back again fast and dependably . . . *and that's what keeps costs down and tonnage up!*

Features include: 4-wheel positive drive, 4-wheel brakes and 4-wheel steering, with a wider, tapered-end design that permits minimum turning clearance. Controls are centrally located; the operator has equal visibility in either direction. Separate motors for traction, conveyor drive and hydraulic pump drive. Hydraulic cable reel; hydraulically-adjustable elevating discharge. ● For full data, address **Joy Manufacturing Company, Oliver Bldg., Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ont.*



JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

W&D CL 4575

JOY MINE-AIR COMPRESSORS



Engineered expressly for Underground use
. . . not an adapted machine

JOY builds the only complete, modern line
. . . Note these Advantages –

TWO-STAGE COMPRESSION gives 15% more efficiency, low discharge temperature, ends carbon.

AIR COOLING eliminates water pipes, cylinder jacket scale.

FORCE-FEED LUBRICATION reduces cylinder wear and friction losses.

DIRECT-CONCENTRIC VALVES minimize air friction, end valve shock and flexing.

CROSSFLOW INTERCOOLER lowers air temperature between stages for greater efficiency.

Joy Mine-Air Compressors are highly efficient, ruggedly built, portable air-plants designed specifically to give reliable service underground.

Four sizes are offered—130, 175, 240 and 275 CFM, at 115 PSI—in rubber-tire and track models, either self-propelled or draw-bar types. All units can be furnished with either open or permissible construction.

Let us show you how a Joy Mine-Air Compressor can satisfactorily answer *your* underground air supply problems. ● *Write for Bulletin A-53.*

Consult a Joy Engineer

WAD CL 3983



JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

Shaves time from every working cycle



Le Roi Transo TLF-150 Front-end Loader

YOU move more material—faster—at lower cost — with this Le Roi Transo 1½-yard Front-End Loader. It saves you money every minute it's working — and here's why:

You load faster — because . . .
Patented "bucket-rocking action" helps you get a full bucket load within seconds, without tire-spin or undue strain on the loader.

You travel faster — because . . .
Four-wheel drive and low center of gravity provide powerful traction. Torque converter transmits power fast and efficiently. You get in and out in a hurry — in sand, mud, snow, or rocky terrain. Planetary-type reversing transmission cuts reversing time 95%.

You can maneuver the TLF-150 easier and in less space, thanks to power steering, short (84") wheelbase, short over-all length, and small turning radius. Low carrying position of bucket gives operator especially good vision and provides an extra margin of safety.

You dump faster — because . . .
14-foot maximum dumping height and 3-foot reach let you spot loads quickly with pin-point accuracy over high truck tail-gates, bins, hoppers.

Now, don't just take our word for all this. See a Le Roi Transo TLF-150 in action, see how it makes shorter work of your material-handling jobs—how it cuts time and costs. Have your nearby Le Roi distributor arrange a demonstration.

Write for latest bulletin.

TD-12

TRANSO DIVISION LE ROI

LE ROI COMPANY

A Subsidiary of Westinghouse Air Brake Co.
TRANSO DIVISION
MILWAUKEE 14, WISCONSIN

Plants: Milwaukee • Cleveland — Greenwich — Dunkirk, Ohio • Coldwater, Michigan

"We get maximum production of coarse coal under all conditions with Du Pont 'Monobel' AA,"

states George Higinbotham, president,
Consolidation Coal Company (W. Va.), Fairmont, W. Va.

"We've used 'Monobel' AA ever since it was first introduced into the northern West Virginia district," continued Mr. Higinbotham. "It consistently gives us top-quality coarse coal and, personally, I think it's the most dependable permissible that's come along. Our No. 32 mine at Owings, W. Va., is a typical operation using 'Monobel' AA."



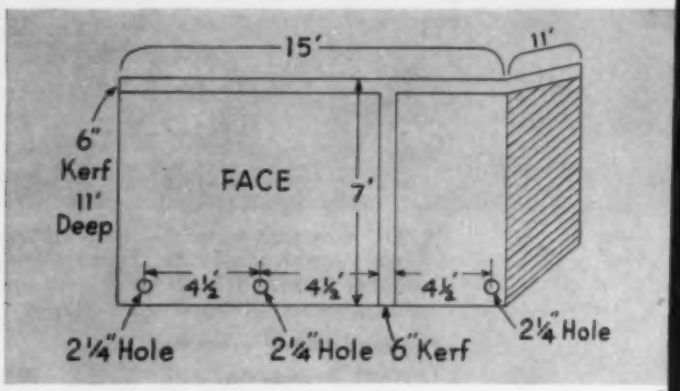
1. Characteristic fall of coal made with Du Pont "Monobel" AA in Consolidation's No. 32 mine. L. H. Kelly, foreman, sounds roof after shot. In his opinion, "'Monobel' AA lays the coal down loose, gives good loadability with minimum of fines."



2. Loader moves in quickly after shot, since "Monobel" AA makes a minimum of fumes and smoke. Its water resistance withstands wet bottom hole conditions. Wide spreading action of "Monobel" AA shears back of the cut and ribs cleanly.



3. Loaded buggy shows high percentage of coarse coal consistently produced by "Monobel" AA . . . representing profitable, high tonnage per man. Small percentage of fines makes cleaning easier and faster.



4. This standard shooting pattern used in No. 32 mine was developed in cooperation with Du Pont technical service men. All rooms are top cut and sheared. Du Pont Iron Wire Electric Blasting Caps are used for maximum economy.

Widely used throughout the coal-mining industry, Du Pont "Monobel" AA has earned the approval of many prominent mine owners and operators. Their experience has proved it to be the most satisfactory permissible they've found. Try it in your own operation. Ask the Du Pont Explosives representative in your district for complete information about "Monobel" AA. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

DU PONT
PERMISSIBLES
Blasting Supplies and Accessories

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

YOU GET ALL THREE with a Goodman Type 98 BELT CONVEYOR

STRENGTH

The Type 98 is designed for heavy duty shuttle car gathering or main line haulage. Lateral strength and rigidity in the line is obtained through a patented lock joint without loss of vertical flexibility on rolling bottom. Belt life is increased because of assured frame alignment; ordinary maintenance is greatly reduced.

PORTABILITY

"Knockdown" style construction of intermediate sections eases moving and assembly in low coal. Heaviest piece is side channel, weighing only 47 lbs. All parts of section are interchangeable, all store compactly.

ATTENTION-FREE OPERATION

A Goodman pre-lubricated, renewable seal, precision idler bearing eliminates need of greasing; can be easily and cheaply repaired at the mine; provides high shock resistance to heavy loads.

Catalog CC-522 describes the Type 98 in detail. A copy is yours for the asking.



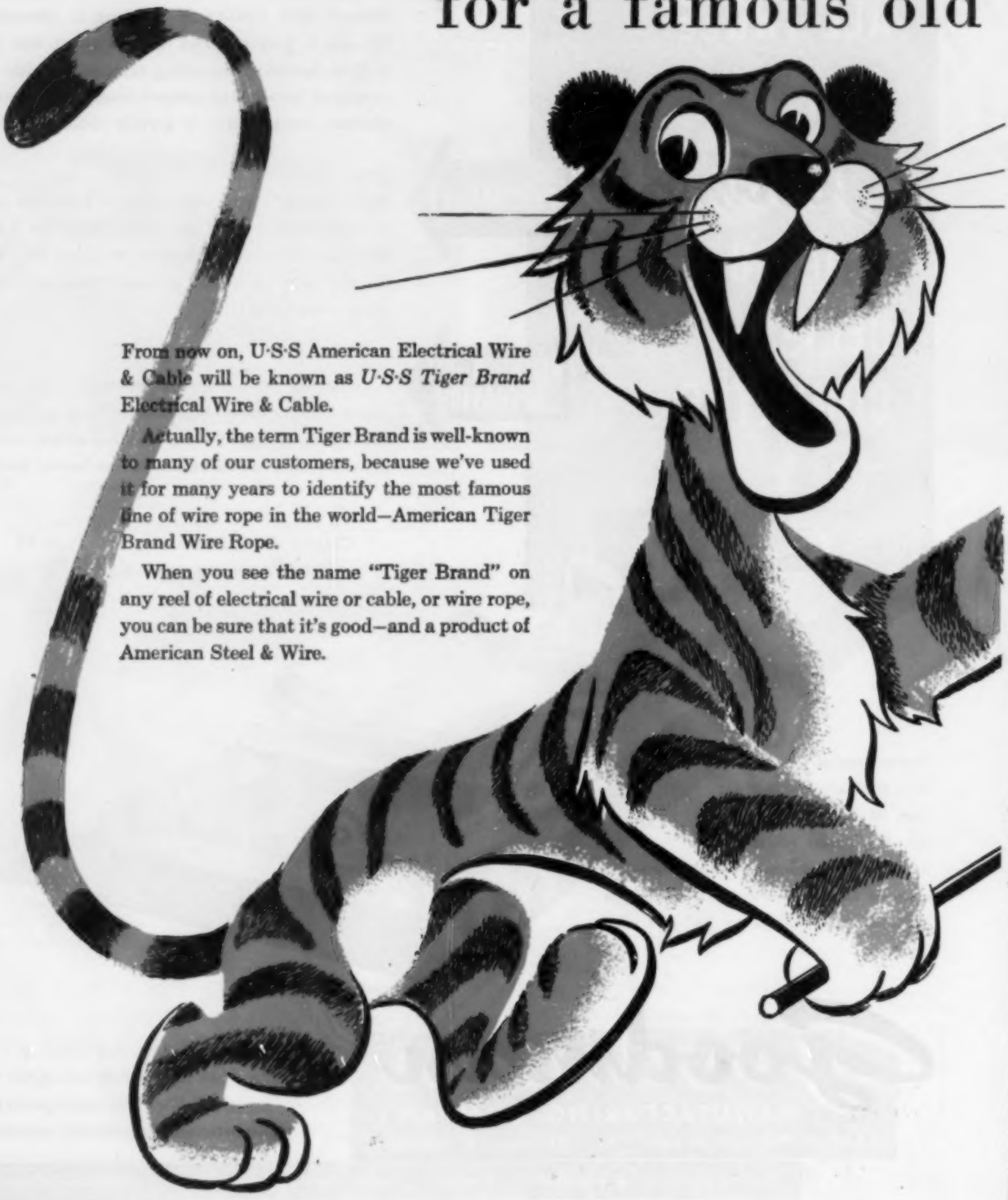
Two assembled intermediate sections of the Type 98. Deck height is only 7½". Idler rollers can be 2½" to 5" in diameter in either offset or inline arrangement as shown. The Type 98 is available for 30" or 36" belt widths.

Goodman
MANUFACTURING COMPANY
4834 S. Halsted Street • Chicago 9, Illinois

Goodman designs and builds a complete line of belt conveyors for practical, low cost underground transportation. Your inquiry is invited.

Cutting Machines · Conveyors · Loaders · Shuttle Cars · Locomotives · Continuous Miners

a brand new name for a famous old



From now on, U·S·S American Electrical Wire & Cable will be known as *U·S·S Tiger Brand* Electrical Wire & Cable.

Actually, the term Tiger Brand is well-known to many of our customers, because we've used it for many years to identify the most famous one of wire rope in the world—American Tiger Brand Wire Rope.

When you see the name "Tiger Brand" on any reel of electrical wire or cable, or wire rope, you can be sure that it's good—and a product of American Steel & Wire.

line of wire and cable



AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION
GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

UNITED STATES STEEL



It's still coal that puts flavor in the roast

Like millions of other farm women, Mrs. Curtis now enjoys the convenience of a gas or electric range, along with refrigeration, a food freezer, running water, a power washer and all the other modern, labor-saving appliances.

But it's still coal that puts the flavor in the roast – bituminous coal, used efficiently in a distant power plant. America's public utilities are burning more than twice as much coal today as they did twenty years ago. Except in a few areas where other fuels are abnormally low in price, coal is the cheapest source of energy – cheaper even than water power. The TVA is now supplementing its great hydroelectric installations with coal-burning steam plants.

Another reason large fuel buyers favor coal is the assurance of continued supply. Even at our ever-mounting rate of consumption, known reserves are ample for a future measured in thousands of years. These reserves are well distributed over the United States and great coal hauling railroads like the Chesapeake and Ohio are equipped to handle enormous quantities of coal promptly and efficiently.

Chesapeake and Ohio Railway

Bring your fuel problems to C & O

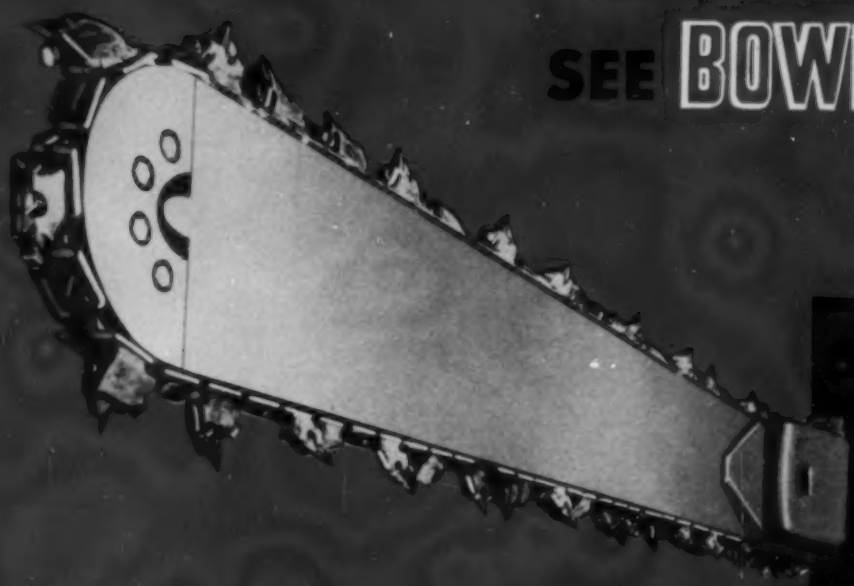
As the world's largest carrier of bituminous coal, the C&O is intimately familiar with every phase of coal use. We have a large staff of experts who will gladly help you to locate the coal best suited to your needs; to help you use it most efficiently; to help get it to you promptly.

Write to:
Coal Traffic Department
Chesapeake and Ohio Railway
2119 Terminal Tower
Cleveland 1, Ohio

COAL...FUEL OF THE FUTURE

coal cutting costs make you see Red ?

SEE BOWDIL* . . .





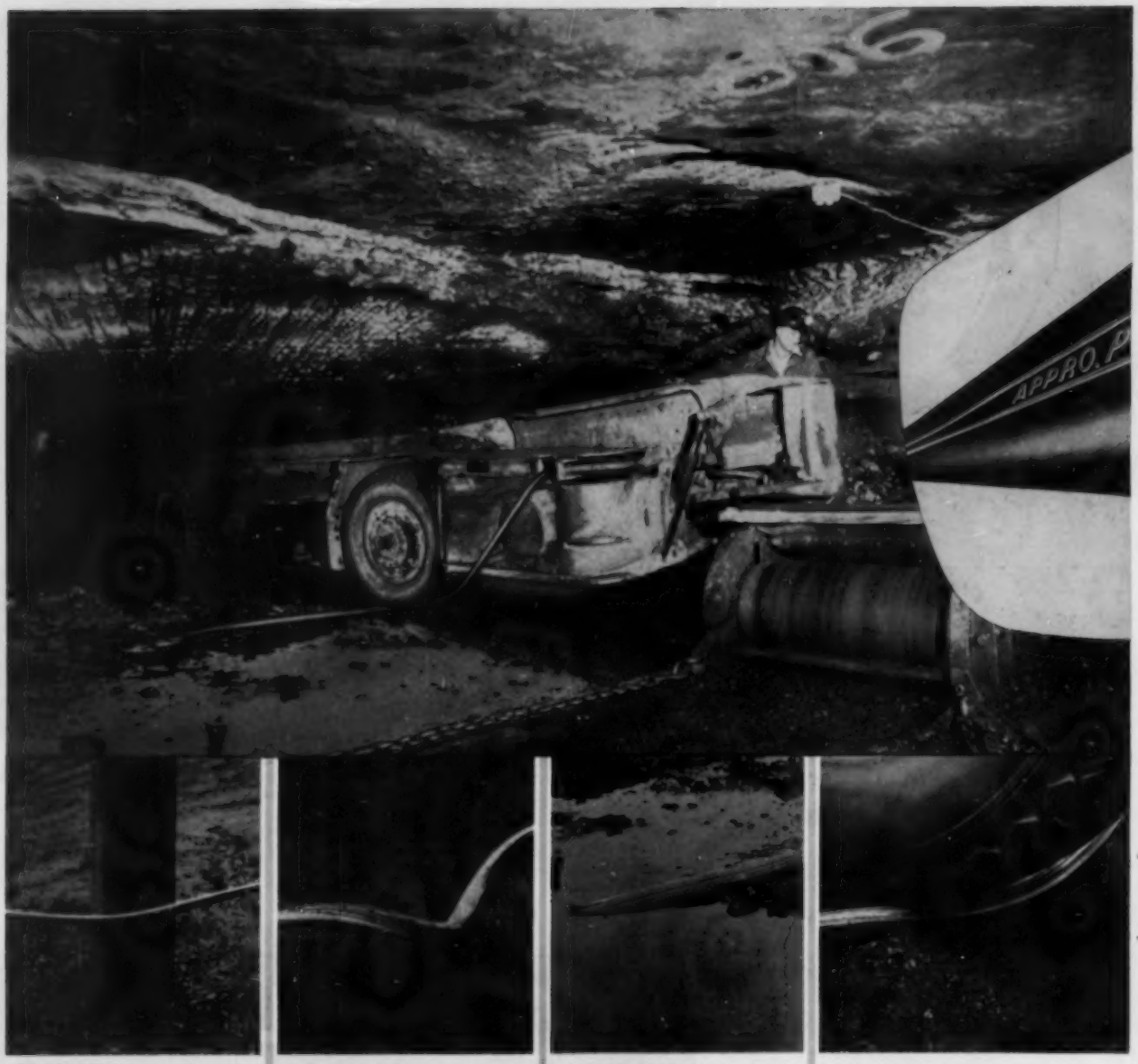
▲ West Kentucky Coal Company, Madisonville, Kentucky, cuts costs in their East Diamond Mine with this mobile cutting machine using Bowdil 9-ft. Cutter Bar, Bowdil Chain and new 1-29 Bowdil Bits.

PHOTO BY WM. VANDIVERT FOR WEST KENTUCKY COAL COMPANY IN COOPERATION WITH BITUMINOUS COAL INSTITUTE

The BOWDIL Company
CANTON, OHIO

* ORIGINATORS OF THROW-AWAY BITS; MANUFACTURERS OF BARS, BITS, CHAINS AND OTHER PRODUCTS FOR COAL MINING; CUSTOM MACHINERY DESIGNERS AND BUILDERS; HEAT-TREAT SPECIALISTS; SALES AGENTS FOR THE CINCINNATI ELECTRIC DRILL.

How to reduce cable failure twisting, bending, pulling



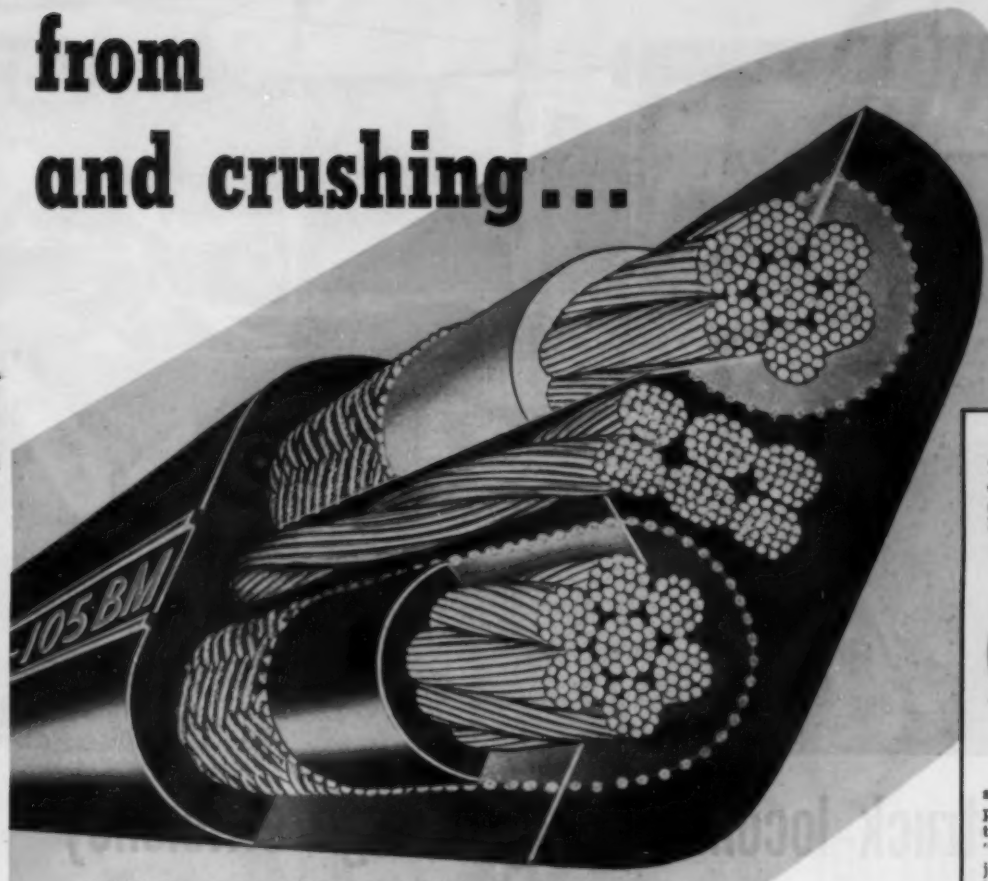
TENSION—Tire-tough compact construction, molded in lead, protects Rome 60 Mining Cables against extreme tension and abrasion.

TWISTING—Firm interlocking braid prevents loosening of conductors and sheath separation when cables are twisted and bent.

IMMERSION — Protection against moisture, corrosion and flame is assured by the rugged sheath and a specially compounded rubber insulation, suitable for operation up to 75°C.

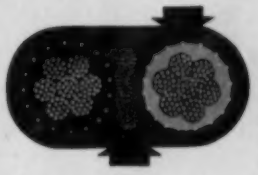
CRUSHING—Resilient Neoprene web between insulated conductors and grounding conductor provides high impact resistance and protection against "shorts" when cables are accidentally crushed.

from and crushing...



"P-105 BM" molded in the Neoprene sheath is your assurance of compliance with Federal and Pennsylvania Safety Codes.

The open braid around each conductor firmly interlocks it to sheath . . . prevents twisting, loosening and pulling.



The grounding conductor is solidly embedded in a Neoprene web which gives exceptional protection against "shorts" and mechanical injury . . . yet maintains flexibility and minimizes conductor distortion and fatigue.

Interlocking braid on Rome 60 Shuttle Car Cables prevents sheath separation

Look at the beating a shuttle car cable takes during just one shift! In the space of a few hours it is pulled back and forth from face to locomotive adding up to miles through mud, crushed rock and coal. It is twisted, bent and scraped around timbers, subjected to extreme tension, and crushed under machine wheels. It is attacked by moisture and corrosive oils and greases.

Rome 60 mining cables are especially designed to stand up under these severe operating conditions and to give you exceptionally long service life. Firm interlocking braids securely fasten each conductor to the tough Neoprene sheath—preventing internal twisting and separating from sheath. A tough, resilient Neoprene web separates insulated conductors from grounding conductor—assuring maximum flexibility, high impact resistance and protection against "shorts." The Neoprene sheath itself is molded in lead to a tire-like toughness—providing high resistance to oils, acids, abrasions and flame. Heat and moisture resistant rubber insulation is suitable for operation up to 75° C.

Plan now on getting full value from all your mining cables and preventing costly down time by standardizing on Rome 60 mining cables.

It Costs Less to Buy the Best

The Rome 60 Line Includes:

- Single Conductor Locomotive Cables
- Concentric Mining Machine Cables
- Flat Twin (Parallel Duplex) Mining Machine Cables—Types W and G
- Type SO Portable Cords
- Multiple Conductor Portable Power Cables—Types W and G
- Shot Firing Cord
- Mine Power Distribution Cable
- Shovel and Dredge Cables

ROME CABLE
Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

ROME CABLE ROME, N.Y.



G-E swivel-truck locomotives give high efficiency with high speeds and improved operator protection

Mine operators, constantly alert for new ways to speed up their present haulage to obtain increased output and reduce operating costs, approve the sturdy, powerful G-E swivel-truck locomotive. This high-speed, four-axle locomotive cuts haulage time as much as 50% to 90%, and has *safety* and operating features that are equally popular with owners and operators.

Hauls bigger loads at higher speeds

Controls on the locomotive are conveniently grouped and co-ordinated for efficient operation. Bigger loads can be started and accelerated rapidly because the smooth application of power permits operation close to the slipping point of the wheels. Equalizing action of spring suspension smooths out the ride over irregular track and lessens track wear. Because it is built to hug the rails, the locomotive can haul trains at higher speeds.

Designed for easy maintenance

There are relatively few parts on the locomotive that require daily or weekly lubrication. All points are readily accessible for quick, easy servicing. The balanced, all-welded frame is a strong, permanently-rigid structure without joints and free from bolts and rivet heads. High, rounded end frames provide maximum protection for the operator.

Built to stay on the job

The G-E swivel-truck locomotive is built for the job and stays on the job because its rugged, carefully engineered construction gives it staying power and requires little maintenance. You, like many other operators, can depend on this locomotive to bring your loads out faster day after day. **For more information, ask your G-E Apparatus Sales Office for GEA-4676. Or write General Electric Co., Section 120-66, Schenectady 5, N. Y.**

SOME OF THE MINING COMPANIES NOW USING ONE OR MORE G-E SWIVEL-TRUCK LOCOMOTIVES:

- Christopher Coal Co., Div. of Pittsburgh-Consolidation Coal Co.
- Consolidation Coal Co., Div. of Pittsburgh-Consolidation Coal Co.
- Mathies Coal Co.
- Jamison Coal & Coke Co.
- Semet-Solvay Div., Allied Chemical & Dye Corp.
- Tennessee Coal & Iron Div., U.S. Steel Corp.
- Truax-Traer Coal Co.
- United States Potash Co.
- Weirton Coal Co., Div. of National Steel Corp.

GENERAL ELECTRIC



ROCK RATED!

for the hardest years ahead

Your profits depend on the strength and speed of loading equipment — and P&H gives you more of *both*.

P&H *greater strength* comes from welded alloy steels — the toughest construction known. No wonder P&H can take pounding and shock loads that K.O. less rugged machines.

P&H *greater speed* comes from Magnetorque* Electric Swing — actually 15% to 25% faster than any other machine of its size to give you greater production, lower tonnage costs. And it's goodbye to maintenance and replacement problems for years to come . . . Magnetorque lasts the life of your P&H.

But to get fully acquainted with this outstanding producer, let us direct you to a 955-A in action. If you want bigger capacity, same advanced design, ask about the P&H 1055-A (3½ yd.)

P&H MAGNETORQUE*

Electric Swing puts you beyond the "clutches of wear"

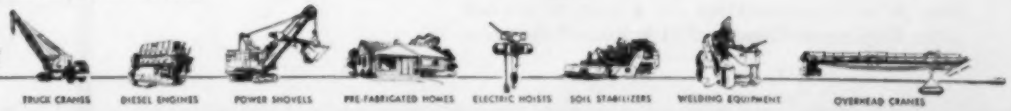
*T.M. of Harnischfeger Corporation for electro-magnetic type coupling.

P&H LARGE EXCAVATOR DIVISION

HARNISCHFEGER CORPORATION

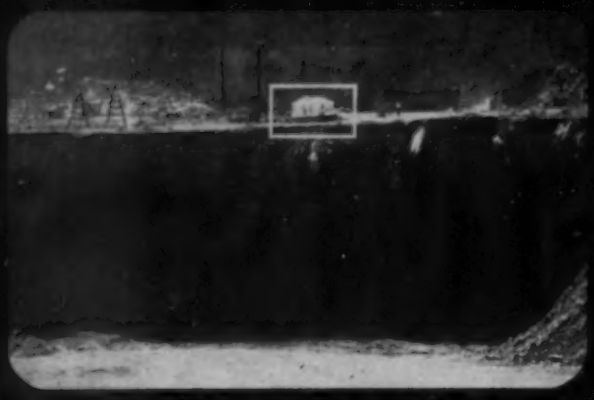
• MILWAUKEE 46, WISCONSIN

the P&H *Line*



TRUCK CRANES · DIESEL ENGINES · POWER SHOVELS · PRE-FABRICATED HOMES · ELECTRIC HOISTS · SOIL STABILIZERS · WELDING EQUIPMENT · OVERHEAD CRANES

"Less shake...





Less noise...





No broken glass..."



WITH the help of the ROCKMASTER® blasting system and a greenhouse, the North Jersey Quarry Co., Millington, N. J., has built good community relations. They proved to nearby neighbors that their blasting produces less vibration in a dwelling than that of a slammed door.

The greenhouse is only 48 feet from the quarry face. Yet after the blast there wasn't a single crack in a pane of glass . . . the concrete foundation was in perfect condition. That is convincing evidence for any neighbor worried about his home.

By initiating the blast at the bottom of the holes . . . the point of maximum confinement . . . the ROCKMASTER blasting system keeps the explosive force confined where it does all its work on the rock. There is minimum air blast, no wild flying rock, no wasted explosives power . . . a well broken, easy-to-dig pile is the final result.

For quarrying, mining and construction work, see how ROCKMASTER can increase your blasting efficiency and improve your public relations. Ask your Atlas representative for a copy of the new Atlas Explosives Catalog that is just off the press.

BLAST DATA:

Number of holes	9
Average depth	56′
Spacing	17′
Burden	6 to 20′
ROCKMASTER delays	0 through 8
Average stemming	17′
Diameter of holes	6″
Total powder (Apex #4 HV and #2 MV)	3025 lb.
Rock produced	14,000 Tons
Powder factor	4.63
Loading started	8:30 AM
Loading finished	10:30 AM
Blast fired	11:15 AM

ATLAS

ATLAS EXPLOSIVES

"Everything for Blasting"

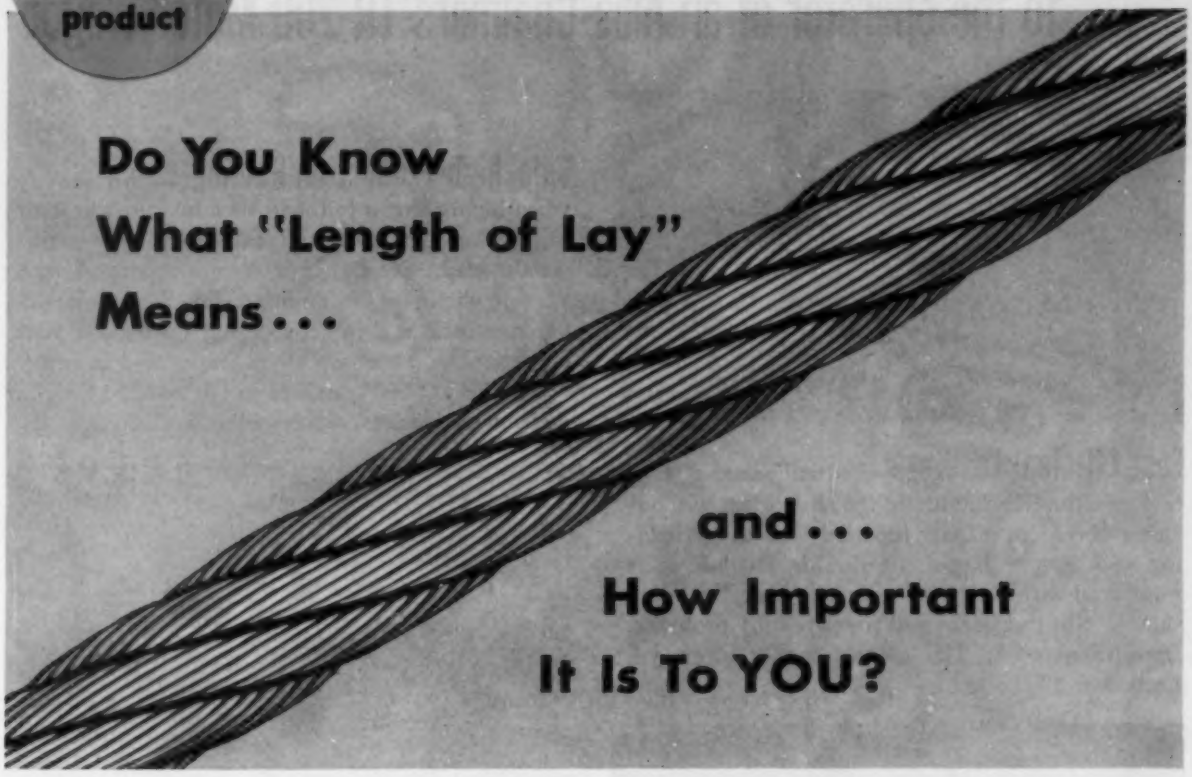
ATLAS POWDER COMPANY,
WILMINGTON 99, DELAWARE

Offices in principal cities

an ACCO product

AMERICAN CABLE

"GREEN STRAND" WIRE ROPE



Length of lay is the distance allowed for a strand to make one complete turn around the wire rope. This distance varies depending upon the construction and diameter of the rope, and upon the service requirements. The service factors which must be considered are elasticity, flexibility, stability, resistance to abrasion, and strength.

Elasticity is desired in order that a wire rope may absorb the application of loads gradually and not with sudden shock. The shorter the lay, the more elasticity in the rope. The reverse is also true.

Flexibility is that quality which a rope possesses which permits it to be flexed or bent around sheaves and drums. This property is desired from a standpoint of fatigue resistance of wires in a rope when subjected to bending stresses. An increase in length of rope lay tends to make the rope less flexible. This does not necessarily mean that a rope with a longer lay would also have less resistance to bending fatigue with which the term flexibility is often confused.

Stability of construction can be described best by observing the result of twisting the ends of a towel in opposite directions. You will find that the structure becomes harder with the increase in the amount of twisting. It will resist distortion when outside compressive force is applied. The same is true in a strand or in a finished rope. In effect, the shorter the lay the more it will resist crushing.

Abrasion resistance would seem to require more and larger crown wires per foot exposed to wear. Shortening the lay exposes more crown wires and makes the rope more flexible so larger diameter wires can be used. Then it becomes a matter for our engineers to set the length of lay to provide abrasion resistance but not at the expense of the other factors.

Strength of a wire rope is definitely influenced by the length of its rope lay. Of two ropes, identical except for their rope lay, the one with the longer lay will be stronger. Although the shortening of lays tends towards certain desirable conditions, a critical point is always reached beyond which the lay cannot be shortened without making the rope stiff.

If all this sounds mighty complicated, forget it. We don't expect you to become a wire rope engineer. That's our job—to engineer and make the best possible wire rope for you. In our "Wire Rope Recommendations for General Contractors" you will find the correct constructions of TRU-LAY Preformed "Green Strand" for your equipment. See your American Cable distributor or write us for a copy of **No. 128-B.**

ACCO

TRADE MARK

American Cable Division
AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

plus ACCO Registered Wire Rope Slings

WHAT FULL CONTROL MEANS

to the operator of an Allis-Chalmers TR-200 Motor Wagon



Fast, Efficient Loading — hydraulic steering control gets the TR-200 under the shovel fast without tiring wheel fight. Large top area permits fast loading with less spillage . . . double steel floor is reinforced with heavy oak plank to absorb loading shocks. Steering jacks and tires are fully protected from falling rock. The TR-200 carries 15 cu. yd. heaped or 18-ton loads.



Quick, Clean Dumping — operator controls two hydraulic jacks to dump and return bowl. Because this unit's wheelbase remains stationary, all four brakes can be set for maximum safety in bank-edge dumping. Rear end dumps far enough over embankment to eliminate rehandling material. Tapered bowl design and 70-degree tilt give quick, complete load ejection. Body may be heated to prevent load freezing.

Safe, High-Production Hauling — no worry when highballing a full load because four-wheel air brakes stop the TR-200 quickly even if the engine should stall. Steering pistons are equipped with stops to eliminate jackknifing. High horsepower-to-yardage ratio and large, rock-lug tires speed your operations . . . even on steep grades and in heavy going. The TR-200 travels at speeds up to 21.6 mph., delivers more loads, reduces idle shovel time.



Plus Added Versatility — The same 176-hp. diesel tractor unit and hydraulic controls may be used to operate an interchangeable self-loading scraper body for large scale stripping and hauling jobs.



GET THE FULL STORY FROM YOUR ALLIS-CHALMERS DEALER

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, WIS.

Exclusive Eaton Features add up to Longer Axle Life, Rugged Dependability, Minimum Shop Time, Lower Maintenance Cost





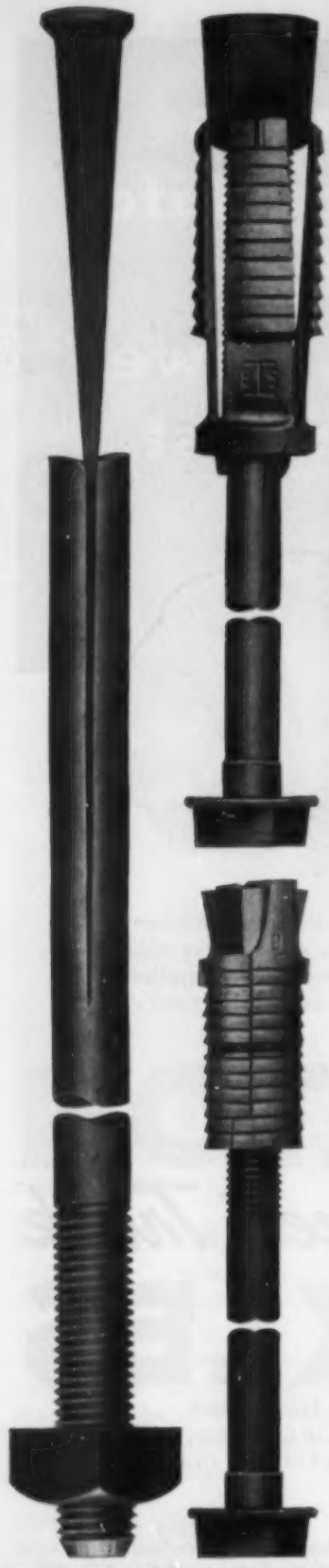
More than two million Eaton Axles in trucks today. For complete information, see your truck dealer.

Eaton's planetary gearing distributes pressure and wear over a number of small gears, resulting in lower unit stress. Forced-flow oiling system provides positive lubrication to all moving axle parts at slowest vehicle speeds. Extra heavy construction eliminates the possibility of distortion or misalignment under full loads. Practical, down-to-earth design makes maintenance quick, easy, economical. Simple shifting makes it easy for drivers to use all available gear ratios. The right ratio for every road and load condition; gives extra maneuverability, positive control at all times. The result of these Eaton features is long, trouble-free axle life, greatest possible vehicle utility at lowest possible cost.

EATON
2-Speed Truck
AXLES

Axle Division
EATON MANUFACTURING COMPANY
CLEVELAND, OHIO

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers





I Sure Like Roof Bolts!

"I've been around mines a long time, and I've seen many improvements over the years. But the one that really strikes me is these roof bolts. Now take this mine. We're using roof bolts in all new workings. It cuts down our accident rate, and gives us more room for mechanized equipment. I'm sold on 'em."

In many mines, operators are obtaining increased production and promoting greater safety for workers by using roof bolts in entries and air courses. This method of roof control eliminates the need for space-consuming timber supports, and improves ventilation.

To enable operators to obtain these desirable conditions, Bethlehem produces two types of roof bolts and shells:

SQUARE-HEAD BOLTS — ⅝-in. and ¾-in. Diameters

The ⅝-in. square-head bolt, recently developed by Bethlehem, is a high-strength bolt, with the same physical characteristics as the ¾-in. bolt. The bolt is furnished without ears, and is recommended for use with Bethlehem's new Type "F" shell. The shell, consisting of two pieces held in place by a wire spring, expands uniformly along its entire length. It has a maximum expansion of 1⅞ in.

The ¾-in. square-head bolt, furnished with an expansion shell, is for use in a 1⅜-in. hole. It has rolled threads and an unchamfered head. Pressed ears on shank support the Type "C" shell during anchoring. When bolt is tightened, the leaves of shell expand, locking against sides of hole. Bolt can also be used with Type "F" shell.

SLOTTED BOLT — This 1-in. bolt has a centered, forged slot. No metal is removed by slotting. The other end of bolt has 5 in. of 1-in. rolled threads. When driven in 1¼-in. hole, the wedge is forced into slot, expanding bolt-end. Truncated-cone point prevents thread damage. Fitted with American Standard Regular Square Nut.

Bethlehem Roof Bolts come in lengths of from 2 ft to 8 ft, and can be installed vertically or at angles. For full details, write to us at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM MINE ROOF BOLTS



Me? Ride to work on wire rope?

That's right. In the course of a year this young lady may travel as much as 150 miles with the aid of wire rope that safely and swiftly whisks her elevator aloft and then just as safely returns it to ground level. It's quite likely that she gets to her job with an assist from Wickwire Rope. Here again—as in so many other fields where wire rope is used—men who manage and maintain the nation's tall buildings have learned to place unbounded faith in the safety and reliability they get from Wickwire Rope.

A YELLOW TRIANGLE ON THE REEL IDENTIFIES WICKWIRE ROPE

THE COLORADO FUEL AND IRON CORPORATION—Abilene (Tex.) • Denver
Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
PACIFIC COAST DIVISION—Los Angeles • Oakland
Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga
Chicago • Detroit • Emlenton (Pa.) • New Orleans • New York • Philadelphia

1854

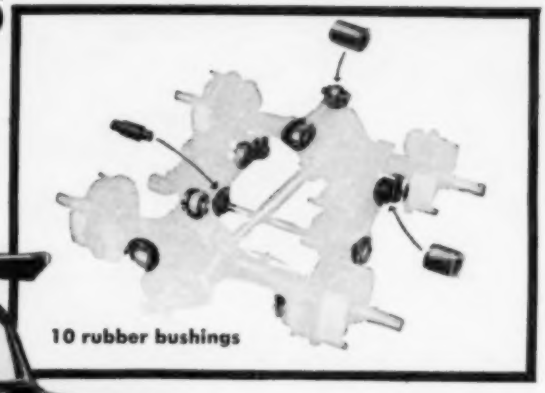
WICKWIRE ROPE
CF&I PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

INTERNATIONAL LEADS AGAIN...

NEWEST, FINEST BOGIE

IN THE 6-WHEEL FIELD

The new INTERNATIONAL bogie provides a new exclusive torque arm design straddle mounted at axle and frame, for greatly increased strength, and new rubber bushings on torque arms, equalizing beams and radius rods for reduced road shock, and elimination of 10 lubrication points. A new self-contained brake and cylinder unit cuts servicing costs, offers greatly increased protection from damage in off-highway operation.



10 rubber bushings



Once again, INTERNATIONAL makes the big news in 6-wheel bogie design. Once again, the pioneer of 6-wheel development and 6-wheel sales leader for 19 straight years tops 'em all in features for efficiency, economy, and long life.

In today's INTERNATIONAL 6-wheelers you get everything that's new and everything that's best, plus such extra-value features as the famous, proved INTERNATIONAL power divider and third differential.

Ask your INTERNATIONAL Dealer or Branch for full facts . . . and a demonstration. You'll quickly see why —for off-the-road or over-the-highway—an INTERNATIONAL Truck with new INTERNATIONAL bogie is the world's best 6-wheel buy.

24 new 6-wheel models!

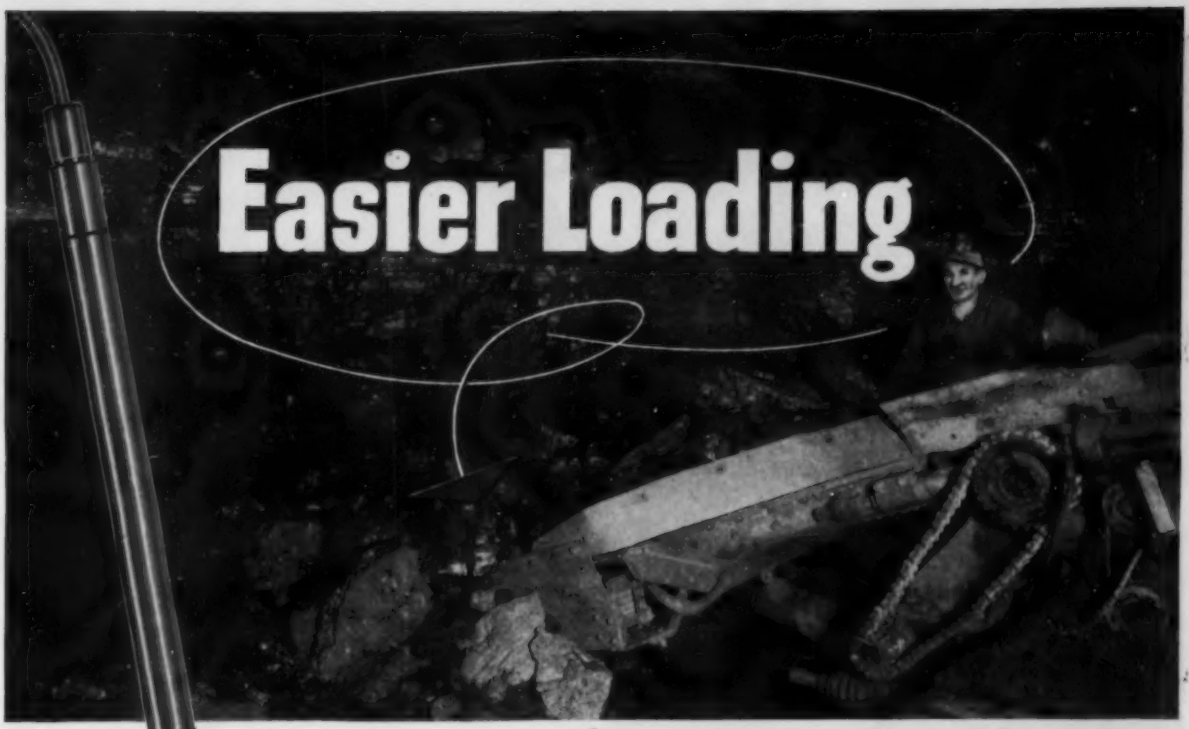
GVW ratings, 22,000 to 90,000 lbs. with new INTERNATIONAL bogie or trailing axle. Engines from 130 to 356 horsepower. Choice of gasoline or LPG power. Diesel engines available in models with GVW ratings of 30,000 lbs. and over. Transmissions, axle ratios for any needs. America's most complete truck line—170 basic models from ½-ton pickups to 90,000 lbs. GVW off-highway models.

INTERNATIONAL HARVESTER COMPANY • CHICAGO

International Harvester builds McCORMICK® Farm Equipment and FARMALL® Tractors . . . Motor Trucks . . . Industrial Power . . . Refrigerators and Freezers.

INTERNATIONAL® TRUCKS

"Standard of the Highway"



reason why **AIRDOX**

NON-EXPLOSIVE MINING METHOD

is the cheapest means known for face preparation



This bank of AIRDOX Compressors provides high-pressure air for dislodging coal in a large mine. Air is distributed through the mine by easily installed tubing.

The picture above tells its own story!

It shows how the "gentler", heaving action of AIRDOX dislodges coal in firm, large lumps, ready for easier, lower-cost mechanical loading. Notice also the excellent condition of the roof structure and face.

Important as it is, this is just part of the savings effected with AIRDOX. In mine after mine, it has also been proven that . . .

- **The actual cost of dislodging coal is less with AIRDOX in practically every case.**
- **AND, because AIRDOX produces less fines, it reduces cleaning costs.**

Our engineers are ready to show you, with facts and figures, the economies you can expect with AIRDOX in *your* mine.
WRITE AND WE'LL ARRANGE A FREE SURVEY.

CARDOX CORPORATION • **BELL BUILDING** • **CHICAGO 1, ILLINOIS**

WAREHOUSES

Harper, West Virginia
Phone: Beckley 4812

Benton, Illinois
Phone: Benton 8-3821

St. Clairesville, Ohio
Phone: St. Clairesville 619

Library, Pennsylvania
Box 427
Phone: Library Colonial 3-6910

Camden-on-Gauley, W. Va.
Phone: Camden-on-Gauley 2181

Evansville, Indiana
307 Northwest Fifth St.
Phone: Evansville 2-8944

Pikeville, Kentucky
Route 2, Box 99
Phone: Robinson Creek 5

Louisville, Colorado
Phone: Louisville 234

Ottumwa, Iowa
Phone: Ottumwa 1900

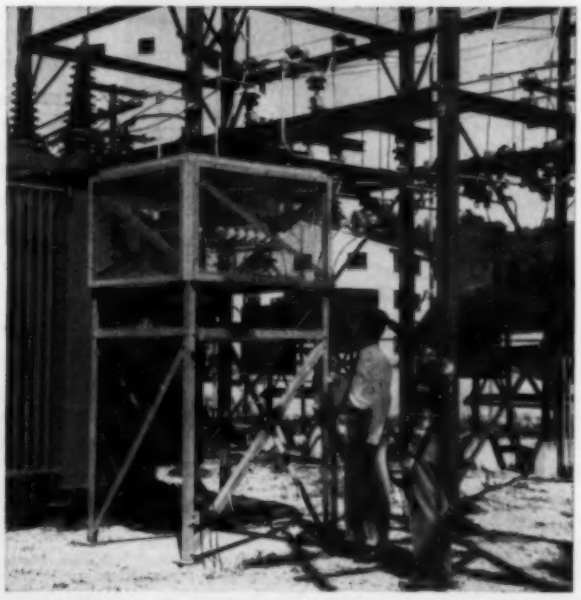


MINIMUM CYCLE TIME on this huge shovel—bucket capacity, 45 cubic yards—and other three shovels at mine is accomplished with help of pin-point control of G-E amplidyne system. Dependable G-E motors and motor-generator sets power shovels.

New Ohio coal mine to produce



ON-THE-SPOT CONTROL OF ENTIRE MINING OPERATION is provided by G-E 2-way radio system from Zanesville headquarters, 48 miles away. Result: outage time is kept low.



MINIMUM POWER LOSSES with this G-E substation which is located near work area. Neutral grounding assures minimum shutdown, maximum protection for personnel and equipment.



ROUND-THE-CLOCK SHOVEL OPERATION—thanks to this five-unit G-E motor-generator set. Split frames of m-g sets, specially designed for shovels, assure ease of maintenance.



INSTANTANEOUS CONTROL of shovels' hoist, swing and crowd motors provided by G-E amplidyne control. System uses fewer components, guards against torque peaks.

5,000 tons/day for power plant

General Electric equipment to help Muskingum mine reach peak output

The new Muskingum Mine, Morgan County, Ohio, soon will be furnishing 5000 tons of strip-mined coal per day to the Ohio Power Company's nearby Muskingum River Plant. In a continuous stream, the coal flows from the mine through the preparation plant, and then to the power station.

Four shovels—all powered and controlled by G-E equipment—are used at this mine. Two of them—one with a bucket capacity of 45 cubic yards—will handle the overburden to a projected highwall of 80 feet. The two smaller shovels load the coal. A G-E equipped substation provides power for the shovel operation.

To integrate the mining, processing production, the mine's Zanesville headquarters—48 miles away—uses a G-E two-way radio system. Eight units are located in the shovels, dispatch cars, and mine office.

You can take advantage of the same expert G-E electrical engineering that went into this system, no matter how large or small your mining project may be. When you specify "G.E." every service of its Apparatus Sales Division—research, product development, system engineering, field engineering, to name but a few—is available to you. Your local G-E Apparatus Sales Representative can tell you more. General Electric Company, Schenectady 5, New York. 663-40

Engineered Electrical Systems for Coal Mines

GENERAL ELECTRIC

S-D "Automatic" Adequate Surge Bin Are to Low Cost Coal Mining

THIS COMBINATION HAS AS MUCH TO DO WITH CUTTING YOUR MINING AND PREPARATION COSTS AS IT DOES IN REDUCING YOUR HAULAGE COSTS!

A continuous supply of coal from the face to the preparation plant is absolutely necessary to produce coal at the lowest possible cost. The only dependable way this can be accomplished is through the use of an adequate surge bin which will serve as a temporary storage for coal in transit. The only practical method of filling a surge bin is with Automatic Bottom Dumping Cars. This Surge Bin used with S-D "Automatic" Cars permits your mining operations and preparation plant to function independently of each other. For each to operate at the lowest possible cost, they must be carried on independently:

1. Any cleaning plant works best, and at the least cost, with an even continuous supply of coal. The Surge Bin continues to supply coal to the preparation plant when, for any cause, there is a delay at the face.
2. With an adequate surge bin, one shift operation of cleaning plant is often sufficient to take care of two shift operation of mine. Breakdowns or delays at the preparation plant need not stop mine production because the surge bin will take the coal until repairs are made.





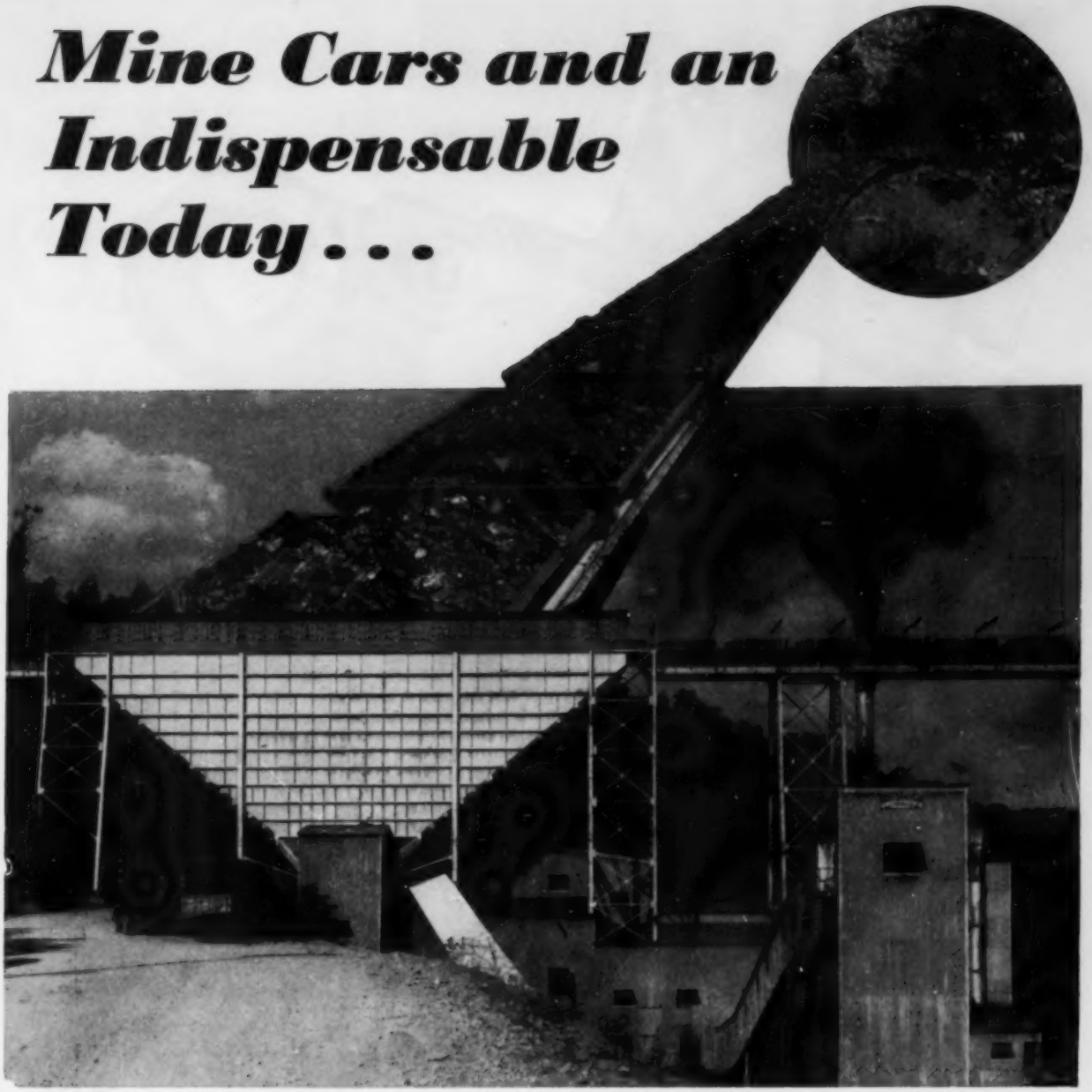
One who has not observed automatic coal haulage cannot visualize the continuity and smoothness of the operation. The cars are loaded and hauled by locomotives in the usual manner. As the trip of cars approaches the head house, they pass over an automatic scale where the coal is weighed in motion. The trip moves on to large surge bin (see top photo at right) where the cars automatically lay down their load of coal without breakage and without hesitation.

S-D "Automatics" haul your coal, non-stop, as it is mined until the surge bin has been completely filled (see lower photo above) and the coal has been automatically leveled with the track from end to end. After dumping, the car doors are automatically closed and the trip runs smoothly back into the mine for reloading. Slate cars are dumped selectively at wells or slate bins enroute. The whole smooth, continuous operation is accomplished without stopping, with the same locomotive coupled to the same cars and with no delay.

The most economical means of filling a bin is with S-D "Automatic" Bottom Dumping Cars. Usually about

SANFORD-DAY IRON WORKS

Mine Cars and an Indispensable Today . . .



40% fewer S-D "Automatic" Cars are needed because of constant, on-the-move dumping. This lowers the initial installation cost and, of course, maintenance cost. S-D "Automatics" are sealed against dust leakage, reducing track clean-up costs to the minimum. S-D "Automatics" eliminate all manual dumping. This one item is enabling many operators to save thousands of dollars every year! For example, one operator who installed 16 S-D "Automatics" reported he was saving $20,000.00 annually by eliminated manual dumping. Another operator, who installed 250 S-D "Automatics" reported he was saving $100,000.00 annually. Those are cold black figures that in some mines mean the difference between profit and loss! The flexibility of S-D "Automatics" offers additional advantages such as: cars are not limited in size . . . top extensions may be added . . . cars with overlapping ends may be used. Investigate the S-D "Automatic" System now! It may pay you in thousands of dollars annually. Write us today!

KNOXVILLE 1, TENNESSEE



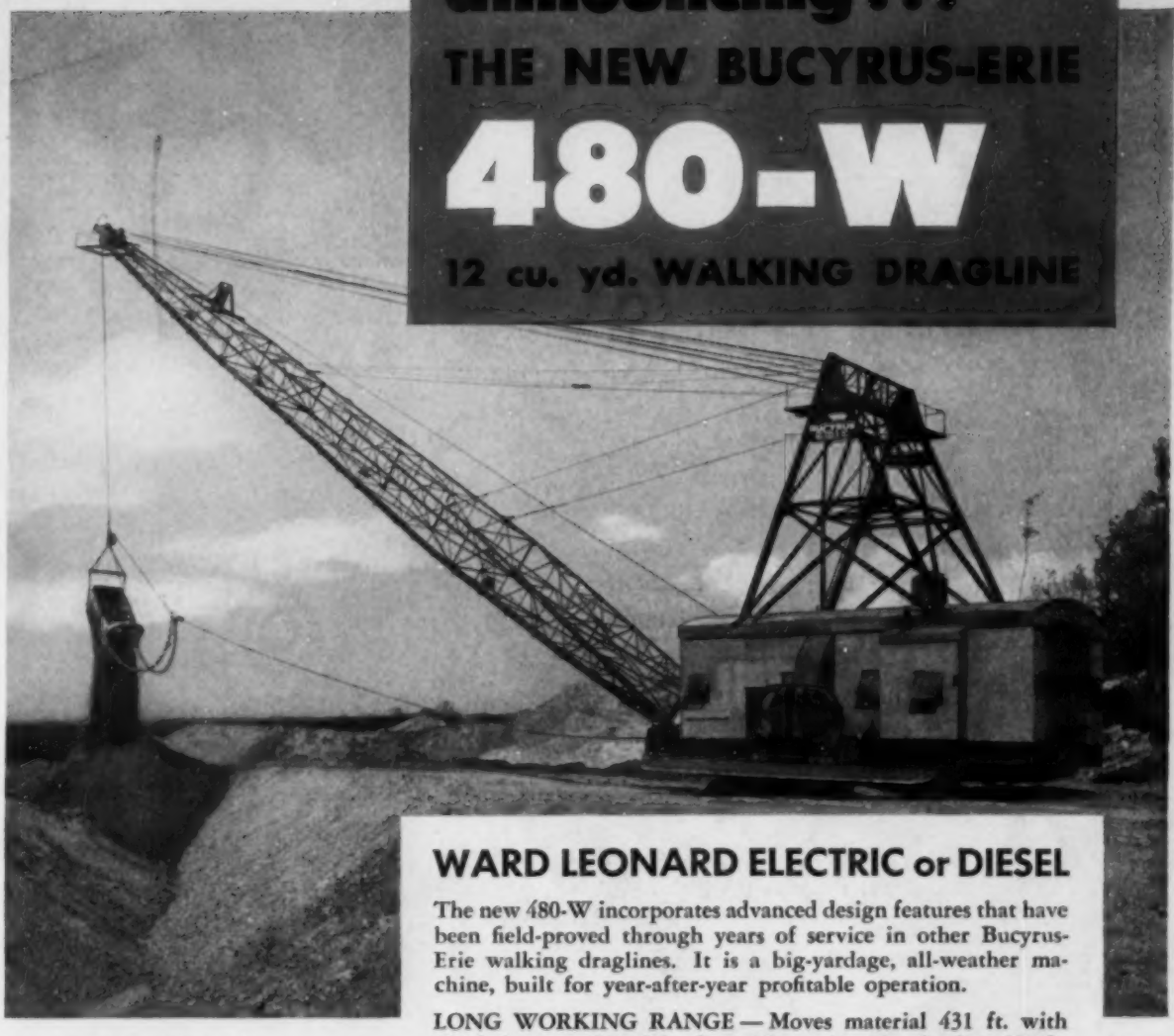
A CLOSE-UP OF THE CINCINNATI "D" JOINT

Universally Recognized as the World's Finest JOINT Assembly in any Cutter Chain

THE ever-increasing popularity of the CINCINNATI "D" JOINT is due to the desirable structural features embodied into this important cutterchain element. Long life, trouble-free service, ease of renewal and a job of factory accuracy when renewal is finally necessary—all combine to make the CINCINNATI "D" JOINT the most effective joint assembly available in any cutterchain. Renewal of inserts is a simple operation that permits the operator to maintain his cutterchain connectors in as-good-as-new condition at low cost and with a minimum of time and effort. The "D" JOINT is just another of the many outstanding achievements by CINCINNATI in the development of coal cutting equipment.

the **CINCINNATI MINE MACHINERY CO.**
CINCINNATI 25, OHIO

announcing . . .
THE NEW BUCYRUS-ERIE
480-W
12 cu. yd. WALKING DRAGLINE



Stripping overburden in Kentucky coal mine.

WARD LEONARD ELECTRIC or DIESEL

The new 480-W incorporates advanced design features that have been field-proved through years of service in other Bucyrus-Erie walking draglines. It is a big-yardage, all-weather machine, built for year-after-year profitable operation.

LONG WORKING RANGE — Moves material 431 ft. with 215-ft. boom and 8-yd. bucket without throwing bucket; 395 ft. with 195-ft. boom and 10-yd. bucket; and 359 ft. with 175-ft. boom and 12-yd. bucket. Digging depths range up to 141 ft.

EASILY MANEUVERED into best working position with exclusive Bucyrus-Erie walking mechanism.

ALL-WEATHER WORKER — Bearing area is large to permit working on soft ground. Weight and loads are balanced so center of gravity shifts through limited range, keeping base rim pressures low.

MAIN MACHINERY IS SIMPLE, and is firmly held in alignment on strong frame. Minimum of moving parts means low maintenance.

ALL-WELDED, TUBULAR-BRACED BOOM provides plenty of strength without excess weight.

BIG OUTPUT results from dependable, year-round performance, fast moves, and rapid work cycle. 45153C

You are invited to send for additional information on how the 480-W can help you solve stripping or other long range excavating problems.

BUCYRUS ERIE

BUCYRUS-ERIE COMPANY SOUTH MILWAUKEE, WISCONSIN



Wire Rope at Work—Here's a load that required deft manipulation by three cranes working as a team. The absorption tower being guided into place was 98 ft long, 11 ft in diameter, and weighed more than 33 tons.

For the lifting and placing of this big, cumbersome load, the cranes were rigged with Bethlehem wire rope, Purple Strand grade, in the 6 x 25 construction; sizes, ⅞-in. and ¾-in. A typical assignment for Bethlehem rope, which so capably handles the toughest lifting and hauling jobs in every kind of industry.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

MINING • CONSTRUCTION • PETROLEUM • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING

BETHLEHEM STEEL

BETHLEHEM WIRE ROPE

Why this special mine jack will give longer, trouble-free service





When Duff-Norton engineers set out to design safer, longer lasting jacks for men who work in and around coal mines, they discovered one startling fact—about 90% of jack maintenance was in replacing worn springs in the mechanism that controls the jack's raising or lowering action. Result? All Duff-Norton mining jacks are equipped with a patented*, adjustable spring mechanism which assures positive engagement of rack teeth. The spring's tension can be easily adjusted with a screw driver without removing any part of the jack. Should the spring eventually lose its resiliency, there's no need to send the jack to the repair shop. A new, complete spring mechanism assembly can be quickly installed by anyone in a matter of minutes, making the jack as good as new! In fact, as a special service, Duff-Norton distributors carry in stock extra spring mechanisms for all Duff-Norton ratchet lowering jacks.

Ask your local distributor or write the world's oldest and largest manufacturers of lifting jacks for a copy of "*A Handy Guide for Selecting Duff-Norton Mine Jacks.*" This colorful, illustrated booklet is full of useful information about all kinds of jacks for coal men. Ask for bulletin AD10-J, The Duff-Norton Manufacturing Co., P.O. Box 1889. Pittsburgh 30, Pa.

The No. 516 MT for medium seam mines is 16 inches high when closed, can raise 5 tons up to 9½ inches.

DUFF-NORTON Jacks

"Giving Industry A Lift Since 1883"



Left Fork Fuel Company finds that

4 belts reinforced with "Cordura" solve tough transport problem...end work stoppages



"CORDURA" REINFORCED BELT NO. THREE. 2,100 feet long, with metal roof 18" above the belt. This 30-inch, 5-ply belt carries 1,000 tons of coal per 16 hours. The pay load is transferred at the junction points by overlapping belts. The entire installation requires the attention of only one man per eight-hour shift.

Impassable roads in bad weather made the transport of coal from the mine to railway spurs a major problem for the Left Fork Fuel Co., of Quinwood, West Virginia. Trucks often "bogged down" in mud, and stoppage of 1,000 tons of coal production per day resulted.

Engineers solved the problem by recommending installation of 4 "Cordura" reinforced conveyor belts. A total length of 9,240 feet of belting was required. These belts were manufactured by the B. F. Goodrich Company. They were installed in August 1952 and have operated continuously with minimum maintenance.

The high strength of Du Pont Cordura* High Tenacity Rayon makes possible belting that's stronger yet thinner . . . belting that troughs better. And its low stretch saves costly shutdowns for take-up and resplicing.

Before you order your next conveyor belt, be sure to inquire about the use of "Cordura" rayon in belts. We'll send you the names of suppliers . . . together with full information about "Cordura" rayon. Just write for your free copy of the booklet "Sinews for Industry" to: Textile Fibers Dept., Room 2520-C, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del. (Offer good only in U. S.)

*REG. U.S. PAT. OFF.

Du Pont "Cordura" High Tenacity Rayon

STRENGTH AT LOW COST

DU PONT

BETTER THINGS FOR BETTER LIVING...*THROUGH CHEMISTRY*

You'll boost your mileage with
ROEPRENE MINE LOCOMOTIVE CABLES

Roebling Roeprene Mine Locomotive Cables are approved by the Pennsylvania Bureau of Mines Approval P-111, and comply with the requirements of the U. S. Bureau of Mines for flame resistance. They are also continuously mold marked for positive identification.



THEY SAVE YOU MONEY because they travel farther and last longer... that's the one big fact about Roebling Roeprene Mine Locomotive Cables. The Roeprene outer jackets of these cables are lead mold cured for *extreme* toughness and resistance to wear, cutting, oils, acids and alkalis. The tinned copper conductors are rope-stranded for topmost flexibility and maximum flex life.

In addition, Roeprene Mine Locomotive Cables have every other construction feature that assures dependable service. Their single conductor is insulated with a high grade heat- and moisture-resistant rubber compound... and woven cotton reinforcing is imbedded in the insulation and jacket to bond the cable into a compact, cohesive unit.

For the last word in efficiency and service economy specify Roebling Roeprene Mine Locomotive Cable the next time you order from your mining distributor. John A. Roebling's Sons Corp., Trenton 2, N. J.

A subsidiary of The Colorado Fuel and Iron Corporation

ROEBLING

ATLANTA, 934 AVON AVE • BOSTON, 51 SLEEPER ST & 5 PITTSBURGH ST • CHICAGO, 5525 W. ROOSEVELT RD • CINCINNATI, 3253 FREDONIA AVE • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST • DETROIT, 915 FISHER BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS ANGELES, 5340 E. HARBOR ST • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS, 1920 E. 2ND ST • PHILADELPHIA, 230 VINE ST • ROCHESTER, 1 FI[illegible] ST. • SAN FRANCISCO, 1740 17TH ST • SEATTLE, 900 1ST AVE S. • ST. LOUIS, 3001 DELMAR BLVD • TULSA, 321 N. CHEYENNE ST • EXPORT SALES OFFICE, TRENTON 2, NEW JERSEY



We grind truck axles to

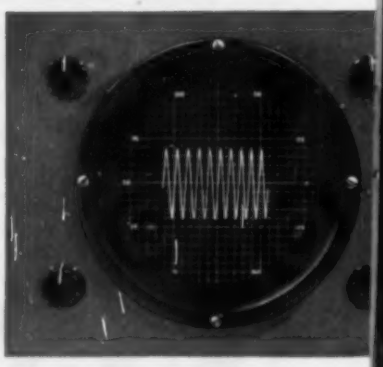
in the new Timken-Detroit indoor proving ground... and only

We jounce, twist and grind them. We abuse, torture and ruin them. We duplicate any on-the-job hauling situation... then add several special brutal tests of our own.

And for good reasons! We can assure you in advance that a Timken-Detroit axle can take a harder beating on the job it was built for than any other axle made!

We capsuled a multi-thousand acre proving ground into one room. Here our engineers put 50 years of experience in building axles for trucks, buses and trailers to work. Here the axles and gearing are subjected—*indoors*—to any *outdoor* hauling condition . . . and scientifically analyzed.

It's research to the "umpteenth" degree. But *you* enjoy: longer truck life; less maintenance, repairs and downtime; lower operating costs. That's why the smart money of truck builders and owners rides on Timken-Detroit axles and gearing.



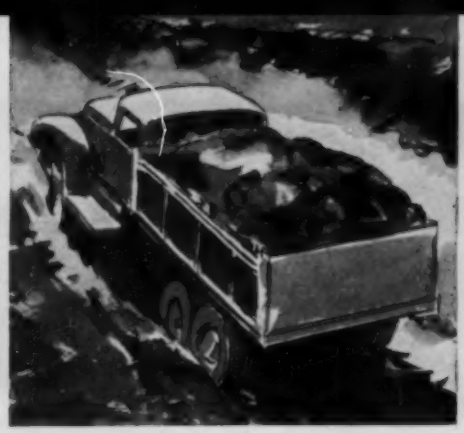
Whatever you haul . . . simulated service conditions show up electronically on a screen like this. For instance—a heavily loaded truck on a bumpy, twisting road—then on a level express highway or long grade. What happens to the axle and gearing is measured, charted with absolute scientific accuracy.



TDA proves axle quality and performance in this "Torture Chamber"

Here we simulate actual highway conditions . . . test quality and performance of axles under any hauling situation, such as duplicating the kinetic energy of 80,000 lbs., G.C.W., at 60 m.p.h. All tests are repeated hour after hour with an automatic cycling control.







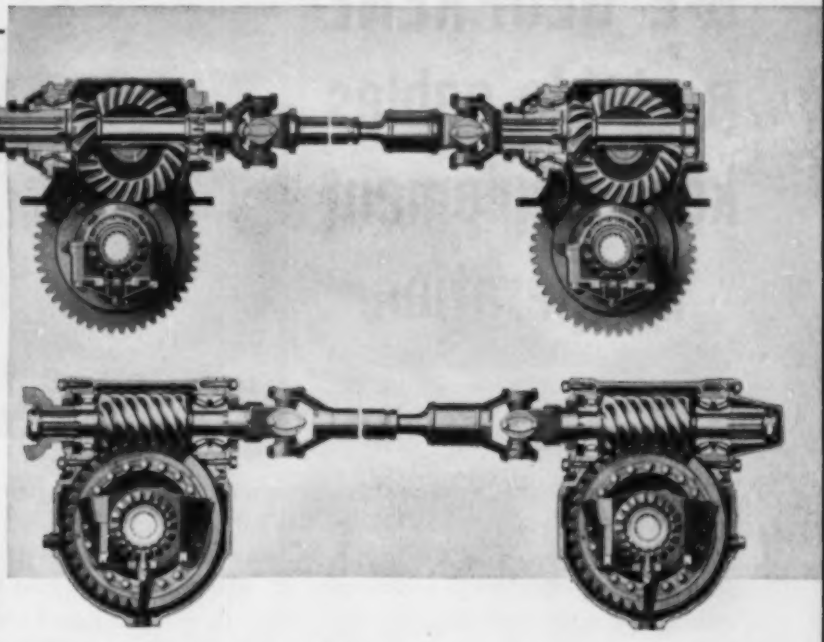
You're hauling overburden . . . you want axles that can get you up, out and on the road – fast . . . with few shifts, low engine r.p.m. and skimpy gas consumption. You want to stay on the job . . . with little expense for maintenance or repairs plus long axle life. You want Timken-Detroit "Torture-Tested" axles with Hypoid gearing!

You're hauling out of the pit . . . loaded to capacity. It's all uphill . . . on soft, twisting makeshift roadway. It's a job for "man-sized" axles and gearing – units that can take rugged going – and not beat the engine and driver to pieces, nor run up costly repairs and shop time. A job for Timken-Detroit "Torture-Tested" axles with Hypoid gearing.

You're down to coal . . . working on any ground that'll stand still . . . you need quick mobility, power – and tonnage per day, too! You want a shovel combination that won't call it "quits" when going's rough. You want rugged gearing and axling . . . easy, low-cost maintenance, economical operation. You want Timken-Detroit "Torture-Tested" axles.

pieces

Timken has it!



TIMKEN *Detroit* **AXLES**

TIMKEN-DETROIT AXLE DIVISION
ROCKWELL SPRING AND AXLE COMPANY
DETROIT 32, MICHIGAN

The Accepted D A Standard

"TORTURE-TESTED"
to Save Money on the Job

WORLD'S LARGEST MANUFACTURERS OF AXLES FOR TRUCKS, BUSES AND TRAILERS

For "Million Mile" performance . . . your choice of two types of Timken-Detroit Tandem Drive Rear Axle Units

Top-mounted hypoid-helical double-reduction final drive. First reduction is hypoid gear and pinion – second is helical spur-gearing. Hypoid gearing, developed for heavy-duty trucks by Timken-Detroit, assures outstanding performance and low maintenance costs for operators everywhere. Large pinions, greater tooth contact give TDA hypoid-helical gearing the ability to stand the "gaff" of extreme shock loads and hard, gruelling hauling service.

2 Famous *patented* FJ worm gearing, pioneered by Timken-Detroit. "Through Drive" type . . . direct transmittal of engine torque through forward driving axle to rear driving axle. Permanently silent . . . simple, sturdy . . . stands extreme shock-loads without damage. Large diameter worm and worm wheel . . . increased capacity roller bearings . . . easy lubrication . . . light weight make FJ highly desirable for high speed service on any kind of grades.

Plants at: Detroit, Michigan
Oshkosh, Wisconsin • Utica, New York • Ashtabula, Kenton and Newark, Ohio • New Castle, Pennsylvania





Over knife-edged rock... through water and ice...

G-E GEOPRENE portable cables keep equipment in operation



When you're trying to get out the maximum tonnage each hour, cables usually take a beating. General Electric Geoprene portable cable is built to withstand the punishment of sharp rocks and sharper ice, and to withstand dragging and crushing. It is built to keep your heavy portable equipment *in operation*.

This cable has a neoprene-base jacket that resists abrasion, oils, acids, alkalies, sunlight, and flame. A tough, corded, reinforcing mesh increases the cable's tensile strength, while the cable itself is constructed for maximum flexibility.

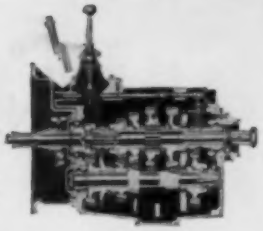
In the full line of General Electric wires and cable you will find cables designed to meet *your* service conditions for all mining applications. For more information, write for the booklet "General Electric Wire and Cable for the Mining Industry," Section W108-314, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

POWER CABLE, AERIAL CABLE, PORTABLE CABLE, DRILL CORD, LOCOMOTIVE CABLE, CONTROL CABLE, SHOT FIRING CORD, TELEPHONE CABLE, BOREHOLE CABLE, MAGNET WIRE.

You can put your confidence in—

GENERAL ELECTRIC

bigger loads faster



Fuller 5-F-1220 Transmission

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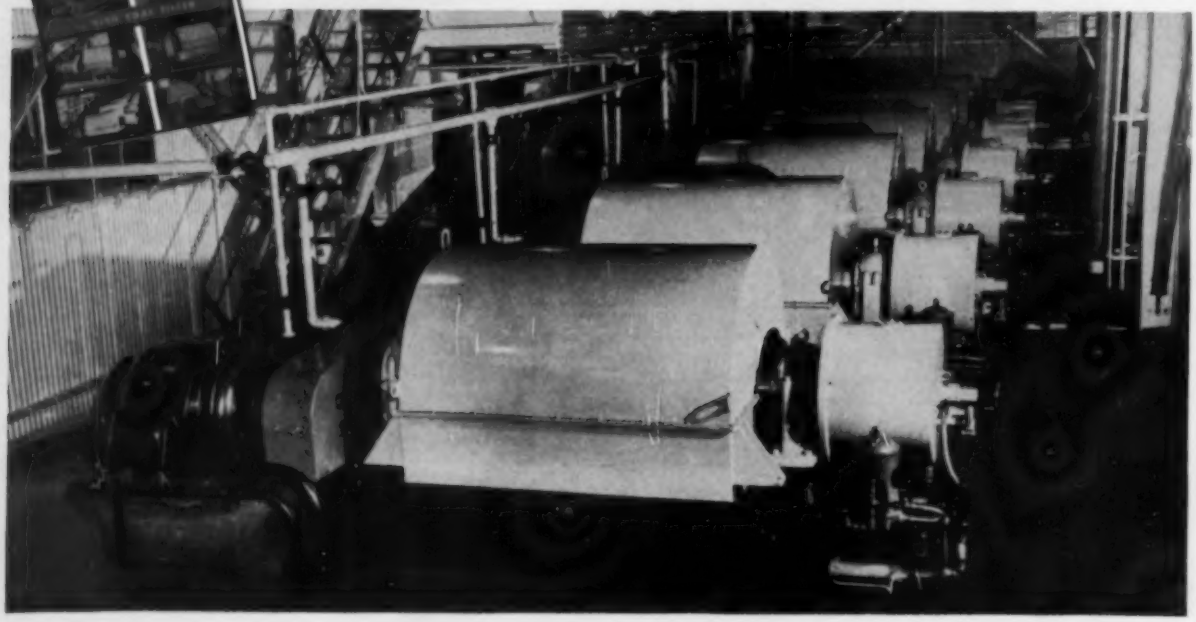
A Bird handling 60 tons per hour of ¼" x 0, containing 10% minus 200 mesh fines, delivers the coal at not more than 7 to 8% surface moisture.

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THE *Coal Age* PREPARATION GUIDEBOOK

How to produce quality coal at low cost

Modern practice and modern equipment

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THE *Coal Age* PREPARATION GUIDEBOOK

HOW TO PRODUCE QUALITY COAL AT LOW COST

BUILDING BUSINESS by making coal more economical, convenient and satisfactory for the user is the goal in preparation. The four major methods of achieving consumer satisfaction are:

1. Proper size for the particular application.

2. Maximum Btu content per dollar spent by the consumer through elimination of impurities and moisture. Good sizing also plays a part here, too, by making possible more complete combustion and thus more liberation of heat at the point where it can be effective.

3. A high degree of uniformity in all characteristics—size, heat content, ash and so on—meaning a product on which the consumer can depend day after day and year after year. Uniformity can be even more important than, for example, maximum impurity removal.

4. Maximum convenience in use. For example, should the coal be treated to eliminate dust in handling? Should the coal, if washed, be dried or treated with chemicals to eliminate unloading and handling difficulties in freezing weather?

Designing for the Market

In setting up a preparation plant or system to attain the preceding goals today—and in the foreseeable future—the first job is to ascertain to the maximum degree possible what the market will require in:

1. Size of product. For example, the trend still is toward the smaller sizes, and is being accelerated by the growing use of coal by the utilities.

2. Ash, sulphur, heat and moisture content.

3. Dustproofing, freezeproofing and other convenience factors.

Next, the coal itself must be studied. It may, in its natural state, provide some of the desirable qualities—or in some exceptional cases, all of them. Where it doesn't provide them, can it be treated so that it does? The latter question usually is the critical one. It may be possible to process a certain coal to meet very rigid requirements for ash, but in the processing it may be necessary to reject an excessive percentage of the raw feed. Therefore, when all the pros and cons are weighed, a greater realization may be secured by a higher ash and a higher recovery with a high degree of uniformity. In the last analysis, in fact, the test is economic, meaning a balancing of realization, plus the promotion value of being able to offer a processed product, against the cost—in equipment, in labor or in loss of raw feed—of achieving certain specifications.

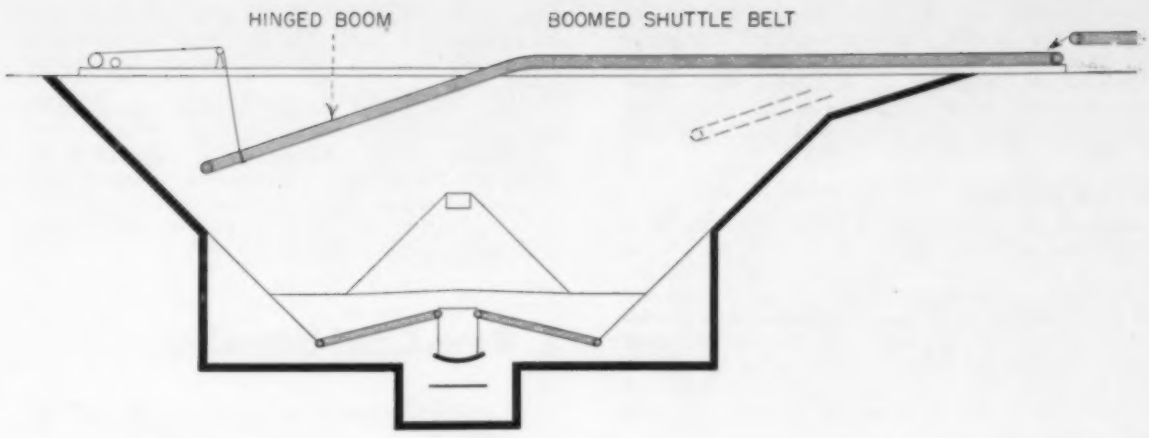
The importance of preliminary study and analysis of market requirements, coal characteristics and possible beneficiation methods can hardly be over-emphasized in building or rebuilding to satisfy the consumer at minimum cost now and in the days to come. Organizations to which coal companies can turn for help include commercial testing laboratories, preparation consultants and engineers, and designers and builders of plants and equipment. Quite frequently, it is well worth running up to several days' output through various types of equipment in pilot or actual operating plants to determine exactly what can be done in mechanical cleaning, for example.

Designing for Low Operating Cost

Actual cost of the preparation operation also is a question meriting the most careful study. Operating labor, including labor for such things as hand picking, is a critical factor. Actual one-man operation of big plants including such processes as washing, separate fine-coal treatment and heat drying, is considered entirely feasible with the help of automatic and remote controls and television supervision. Operation with not over 4 or 5 men is fairly common today.

Maintenance also is critical. Proper design and the use of modern materials is the best way of preventing the spectacle of a maintenance crew as large or larger than the operating crew taking over at the end of a day of plant operation. Then there is the question of changes and plant additions—which are a normal part of the conduct of plant operation. Proper design speeds these changes by providing working space and places to put the new units that changes in the market indicate will be necessary in the future though not required when the plant was first built.

What can be done in these and other directions to build consumer satisfaction through quality and uniformity—efficiently and at low cost—is the goal of the material which follows in this *Coal Age* Preparation Guidebook.



1. Raw-Coal Storage

PURPOSES:

1. Preventing interruptions in mine operation from shutting down the preparation plant and vice versa.

2. Providing some degree of blending of the raw feed to the plant.

3. Providing a means of evening out the flow of coal to the preparation facilities, thus permitting washing equipment, for example, to do a better job.

CAPACITY

Even where raw-coal storage facilities are underground, the prevailing practice is to provide at least ½ hr of the rated capacity of the mine or plant, with 15 min as about the minimum for anything more than a hopper to hold a car or two. From 15 min to ½ hr also seems to be the rule at most strip-mining operations receiving coal from trucks.

A trend toward even larger storage capacity seems in evidence, however. Examples include the following:

Deep mine, outside bin mounted on structural members under a dump bridge and receiving coal from dropbottom cars, 2,500 tons of capacity for a plant rating of 700 tph.

Deep mine, 5-compartment silo mounted on hill above plant, 2,200 tons for a plant capacity of 600 tph.

Deep mine, single concrete silo, approximately ½ day.

Where ground storage is provided, capacities up to 2 or 3 days are provided in some instances, as follows:

Deep mine, bin over slope belt with feedback belt from preparation plant, 10,000 tons, including ground area around bin.

Deep mine, ground storage with feedback belt over glory hole back to slope belt, approximately 1 day.

Strip mine, ground storage at preparation plant, several hours' capacity, conventional reclamation equipment.

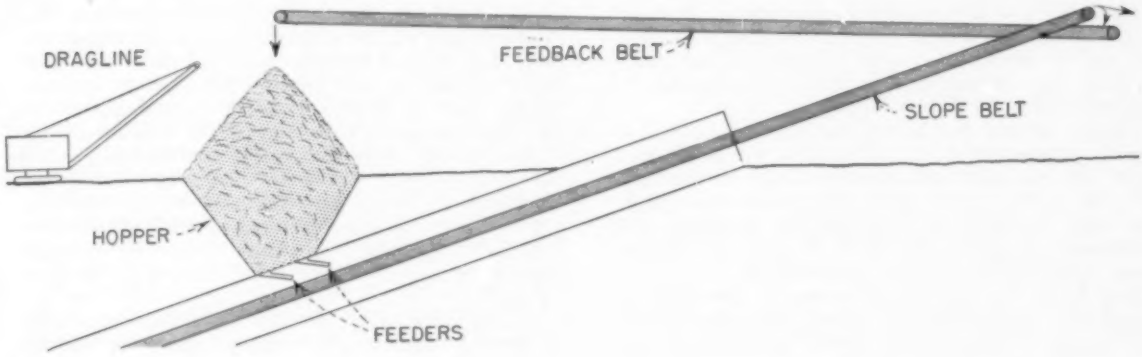
UNDERGROUND STORAGE

Illustrated is a 260-ton hopper feeding a slope belt at a plant rated at 500 tph. The hopper is 16 ft wide and 66 ft long. Maximum depth is 18½ ft. Designed to receive coal from a belt system, this hopper is fitted with a shuttle-type distributing conveyor with hinged boom end. The boom section permits laying coal into the hopper with minimum degradation. The shuttle principle also makes possible maximum use of bin capacity when desired.

The dumping characteristics of dropbottom cars also permit maximum use of bin capacity and thus can cut down size and depth; for example, 96.7 tons in a bin 40x12 ft by 10 ft deep.

Separate smaller rock bins next to the main bin for direct dumping or so located that a flygate can divert rock into them are employed where it is desired to keep coal and rock separate. Normally, dumping is by mine cars, but even hoppers designed to receive coal from belts can be arranged in this fashion provided rock loading onto the belt is sufficiently segregated from the coal.

Underground bins may be lined—concrete, steel plate, etc.—or, if the rock is of the proper character, left in their natural state except perhaps for concrete or steel around the feeder throat, or at other strategic locations. Lining



may be desirable even where the natural rock is good to permit the coal to slide at a lower angle and thus somewhat reduce bin size for a given capacity.

Dual throats and feeders are installed at times where conveyor capacity is high for greater ease in transfer from hopper to conveyor. Also, trouble with one feeder does not halt the entire operation.

SURFACE STORAGE

Although some form of bin or hopper still is the most popular form of surface storage of raw coal, there is, as previously noted, a trend toward open or ground storage. Where space is available for ground storage, the quantity that can be stored can be greatly increased with a minimum of investment. In other words, the cost of bins or hoppers is eliminated, but part of this saving normally is offset by the fact that some type or types of stocking and reclaiming equipment is necessary, even for relatively small tonnages.

An example of a 10,000-ton ground storage installation is shown schematically in the accompanying illustration. As coal is fed back to the slope belt, it eventually becomes necessary to use a reclaiming unit—in this instance, a dragline. A glory hole may be substituted for the hopper shown.

Ground storage may be accomplished by dumping from trucks in a flat pile with bulldozer spreading. Reclamation may be standard shovel and trucks or by tractor-mounted shovels. Another method of stocking is to use a conveyor with an elevated end, receiving coal from trucks, headhouse or tipple. Piling the coal high in conical shape reduces to some extent the ground area required. Pivoting the conveyor to permit continuous stocking in an arc increases capacity per square foot of ground area. And where trucks are employed, a variation applicable to hilly country is to excavate a bench in the hill, with trucks dumping over the back wall and conventional equipment picking up the coal as desired from the bench.

Storage of large quantities of coal in piles or elsewhere requires checking against the possibility of spontaneous combustion.

The conventional square or rectangular bin—steel, concrete or timber—still is the most-used method of providing raw-coal storage where open or ground storage is not employed. However, the round, or silo-type, unit is being increasingly installed. The silo may be built by conventional concrete-pouring methods or may be constructed of regular plate or prefabricated steel sections, or of precast concrete staves bound with steel hoops. A silo 24 ft in diameter and 55 ft high will hold up to 600 tons of coal.

Hilly country provides an opportunity to build the rectangular bin directly on the ground where it can receive coal directly from the dump. However, a number of installations in hilly country in recent years consist of square or silo-type storage bins set out from the dump and fed by conveyors. In flat country, elevated bins naturally are a necessity, and are fed by conveyor or elevator, usually the former.

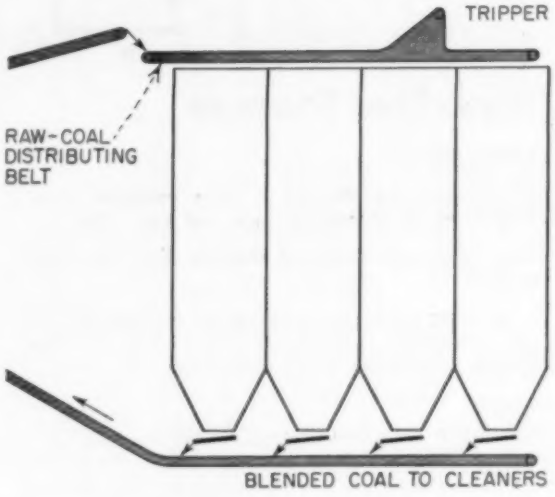
Compartmented or multisilo bins are employed at a number of mines for greater flexibility in storage and also to provide some degree of blending of the raw product. Distribution to a side-by-side or four-cornered multiple unit may be by chutes and flygates. Indicators and remote-controls permit operation of gates and proper distribution without having a man at the bin.

Distribution to long multi-compartment bins may be handled by a distribution belt with tripper. Other methods include a wheel-mounted shuttle belt similar to that employed in loading railroad cars which is moved back and forth to place the coal in the proper compartments. Or a scraper conveyor with fixed openings or movable gates may be used.

In deep bins, degradation may be reduced by installing spiral or ladder-type lowering conveyors.

A growing practice reflecting, among other things, the growth in full-seam mining, is combining rough cleaning and preliminary crushing (if practiced) with surface storage of raw coal to conserve labor, improve plant maintenance and raise plant efficiency.

2. Raw-Coal Blending



PURPOSES:

1. Assuring maximum uniformity in the characteristics of the coal fed to cleaning units and thus in turn, assuring a better final product by enabling the units to do a better job. Uniformity of characteristics in the final product is especially important in metallurgical coal, and the majority of blending plants to date are at metallurgical mines.

2. Providing storage capacity and evening out the rate of flow to cleaning units, thus helping to promote uniformity and quality in the final product in another way.

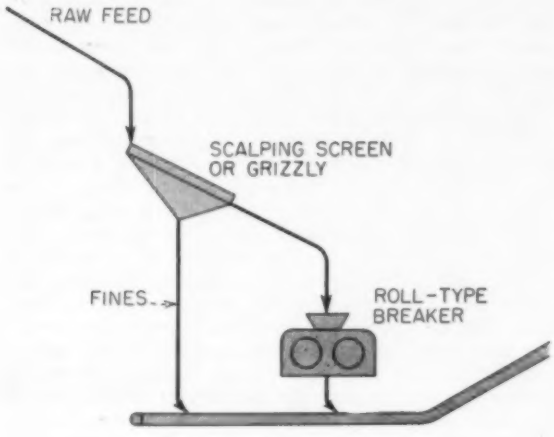
Since the goal in blending raw coal is splitting it up into small increments and then recombining it, also in small increments, the normal blending plant consists of a multicompartment bin with a relatively large capacity—usually 1,000 to 2,000 tons or more. The more the compartments, within reasonable limits, the more the opportunity for splitting and recombining. Also, to facilitate putting small portions of coal into each compartment, the usual practice is to employ a belt with a traveling tripper, though other methods of distributing the coal may be employed. To complete the recombining—and blending—coal normally is withdrawn from all compartments at the same time. Variable-speed feeders are common for this purpose, and permit changes in individual feeding rates to compensate for changes in needs or conditions.

Normally, the coal is placed in the blending plant after preliminary cleaning and crushing. Preliminary cleaning

may, as in one flowsheet, include mechanical cleaning after preliminary rough blending in surge bins and screening to remove fines. In this flowsheet, the rough-cleaned coal then goes to the main raw-coal blending plant and the raw fines to a second smaller blending plant. The final touch is provided by clean-coal blending plants for both metallurgical coal and a steam-coal by-product, the latter largely derived from middlings from the final coarse-coal cleaners.

Withdrawal from blending bins may be by fixed-rate feeders for each compartment discharging to the gathering unit. A refinement is adjustable-speed feeders to permit varying feeding rates as desired. Concrete is the usual construction material for blending bins, though other materials may be and are used.

3. Preliminary Breaking



PURPOSES:

1. To reduce all oversize material in the raw feed to a certain top size, say 6 in, usually done where the market for lump is considered too small to warrant preparing this size.

2. To reduce extra-large lumps without especially attempting to get everything to a certain top size. Convenience and smoothing out the flow of coal through the plant are the major objectives in such breaking. Freeing bone or partings from coal to facilitate picking or cleaning is another objective in some instances.

Preliminary breaking and certain rough cleaning usually go hand in hand, although, for example, if coal is being transferred from a hopper to a crusher preceding a slope belt underground, no attempt is made as a rule to remove rock or impurities before the breaking process. On the surface, however, it is generally accepted that where substantial quantities of rock are encountered it is best to remove at least part of it before sending the product to the breaker. Consequently, particularly where all the coal is to be washed, it is common practice to employ a picking table or—as is increasingly the case—a scalping screen and picking table ahead of the breaker.

Preliminary breaking is almost entirely the province of the roll-type machine although some pick breakers are employed to get closer to the desired objective of reduction with a minimum production of fine sizes. Roll diameter, tooth design, tooth positioning and speed are major factors, along with keeping teeth in good condition at all times. Double-roll crushers are considered to give a higher proportion of coarse material because abrasion against the plate is eliminated. Feeding practice also influences results in this direction. Consequently, usual practice is to scalp out fines and send only large material to the breaker.

In anthracite particularly stage crushing has been the practice for many years because of the nature of the raw product and also the size list produced. In anthracite it sometimes happens that the rock exceeds the coal in the raw feed and therefore picking sometimes is set up to remove coal from the rock rather than vice versa. Whatever the system, however, after scalping out the fines, the coarse coal goes through the first rolls, after which the process of scalping and additional breaking of the large material may be repeated a second and even a third time.

To avoid a multiplicity of units, crushers are offered with a second stage of reduction built into them.

Crushers normally are built to handle iron, particularly if it is not too large. However, the better practice is to keep it out not only of crushers but of the entire plant circuit. If possible, therefore, magnetic removal equipment should be installed ahead of raw-coal crushers; if not possible, at some logical point following crushing, or ahead of the raw-coal screen if preliminary breaking is not the practice. Iron removal is considered a good practice even where washers are employed, since it reduces the possibility of plugging and damage to equipment up to and including the washers.

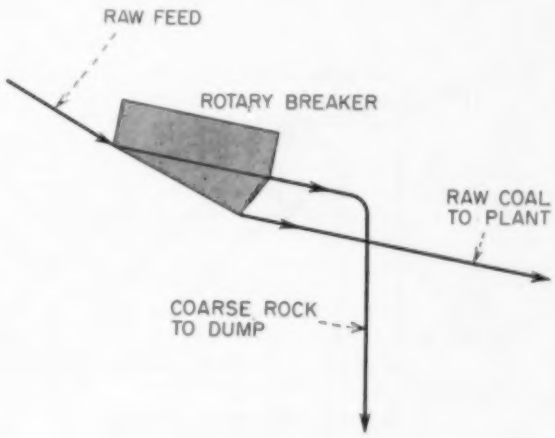
4. Rough Cleaning

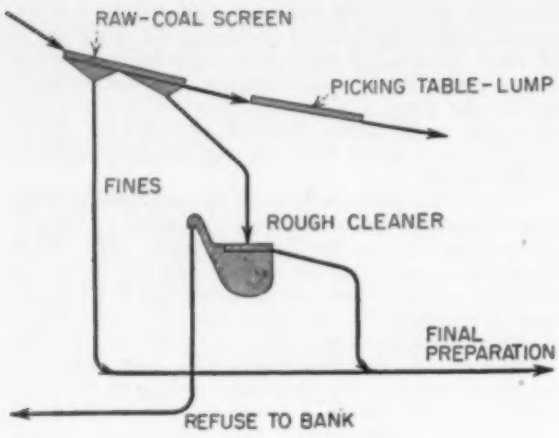
PURPOSE—Quick removal of coarse rock and other impurities to reduce the burden on subsequent preparation units and also to permit higher efficiency in the removal process itself.

The major rough-cleaning methods are as follows:

1. Use of a picking table receiving all the mine-run product.

2. Use of a scalping screen followed by a picking table. This is the preferred system, since it removes the fines and thus facilitates picking, which may be either rough with the idea that final impurity removal will take place in mechanical cleaners, or may be final where the





coarse coal is to be loaded without any further treatment.

3. Use of a rotary screen-type breaker, which accomplishes both a reduction to a certain top size, depending upon the size of perforation, and rejects the hard rock—or at least that portion of it larger than the perforations. Normally, where rotary breakers are employed final cleaning is done in mechanical equipment.

4. Use of roughing cleaners to throw out the major part of the heavy material and prepare the feed for the final units. Fines may be by-passed around the roughing unit, while large lump usually is processed by hand picking. Preliminary breaking may also precede roughing with a mechanical cleaner. A further refinement is hand picking to remove coarse heavy material, followed by breaking and roughing.

Rough cleaning by hand frequently precedes breaking, as noted in the previous section, and has the advantage, among others, of reducing the load on the breaking unit and reducing the output of fine sizes in the breaking operation by getting the hard, heavy rock out of the way.

Separate headhouses or roughing plants are being increasingly employed for preliminary breaking, rough cleaning, mine-rock disposal and raw-coal screening. This is a natural development at hillside mines, but the same practice can be followed at slope and shaft operations. With separate plants, it is easier to put the necessary heavy equipment closer to ground level, reducing structure cost and maintenance. Also, a prime source of dust, noise and vibration is removed from the main plant.

5. Raw-Coal Sizing

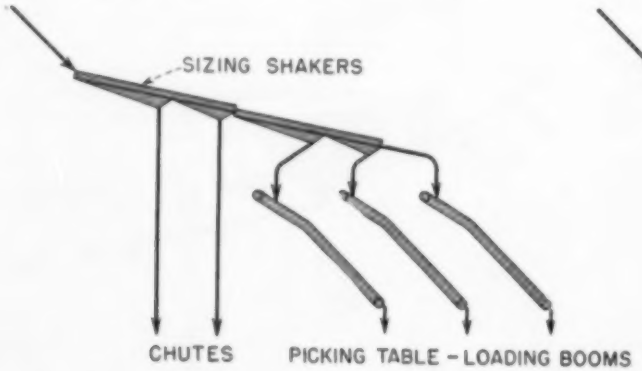
PURPOSE—Separation of the feed into the necessary fractions to permit picking, cleaning and other operations on the various fractions. In plants preparing by hand picking and cleaning, the raw-coal screen may also make the final sizes to be loaded.

The shaker screen, inclined at approximately 15 deg and with a crank or eccentric drive providing a stroke of around 6 in and a speed of 100 to 120 strokes per minute, is the common type of raw-coal sizing device. It is receiving increased competition, however, from vibrating screens, usually of the mechanical type.

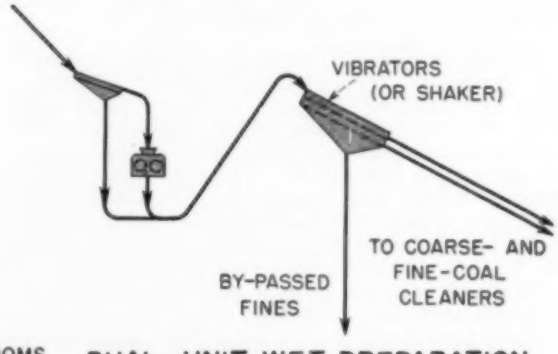
A major difference between the two types of screens lies in the fact that the shaking unit also can be employed to convey and distribute the products, including provision for hand picking, as in plants preparing by hand picking and screening, where one shaking unit, with decks and extensions as necessary, can size the coal, provide facilities for picking, and distribute a number of sizes to their respective loading booms and chutes. If the unit is inclined at the usual angle, lengthening it out requires more headroom. This, among other reasons, resulted in the development of the level shaker with differential-motion drive to move the coal along the unit. A second difference between the two types of screens is the fact that the vibrating type, though it cannot do conveying, provides higher capacity in a given space in many instances. Degradation with either depends upon type of coal, type of screen and method of operation.

The flexible-arm or Parrish-type screen, usually operating at 150 to 185 rpm, 5- or 6-in stroke, 2- to 5-deg slope, is another form of shaker. However, its major use is more for final sizing and dewatering, especially in the anthracite field, where it is widely used for this purpose. In addition to shakers and vibrators, simple raw-coal sizing may be accomplished by the bar or gravity screen, though its accuracy is not as good as the shaking or vibrating types.

With the growing trend toward mechanical cleaning, the raw-coal sizing screen is more and more being called upon for a rather simple separation of the raw feed into two or three fractions. Where this is the situation, the shaker can be a rather short machine. This situation has favored the rise of the vibrator in raw-coal screening also. Even where only a certain fraction of the coal is mechanically cleaned—screenings, for example—or only a certain size or sizes are treated—nut and pea, for example—the simple two- or three-product shaker may be employed,



DRY PREPARATION



DUAL-UNIT WET PREPARATION
(WITH PRELIMINARY BREAKING AND BY-PASSING OF FINES)

with further raw-coal sizing allocated to vibrating screens. This, in fact, is a growing practice at bituminous plants, even where everything, or everything up to, say, 6 in, is mechanically cleaned, particularly if the plant is designed for treating several size fractions in different cleaning units.

SCREENING FACTORS

In addition to inclination, speed and length of stroke (or amplitude with vibrators), some of the factors affecting screening results are:

1. Depth of bed. Since screening can be accomplished only when the smaller sizes work their way down to the plate, depth of bed, in conjunction with size of opening and square footage of screening surface, is a major factor. With large openings, depth of bed may be greater. With smaller openings, bed depth must be reduced or the area of screen surface must be increased. Time also is a factor, though the opportunities for increasing it are somewhat limited and where it is increased degradation and breakage tend to increase with it.

2. Degradation. As previously noted, time is a factor in degradation. Narrow shakers also tend to increase degradation, and there is a major increase when more screen surface is provided than is necessary to accomplish the desired separation.

3. Wear. Heavy loads, coarse material and the possible presence of considerable rock are factors in wear on raw-coal screens. Among the answers for vibrating equipment is heavy alloy wire or alloy plate. On shakers, types of plate used to reduce wear include cast manganese.

6. Hand Picking

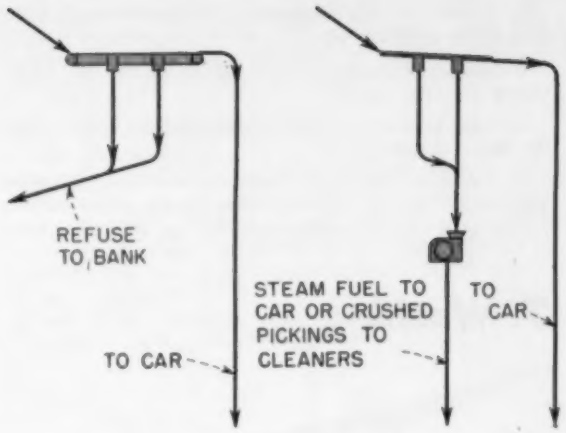
PURPOSES:

1. **Impurity removal.**
2. **Improvement of appearance.**
3. **Production of a separate fuel grade.**

From the standpoint of impurity removal, hand picking normally is effective only on coal 3 in or larger in size. Hand picking for impurity removal may also be extended to improve appearance by removing off-standard material. In addition coal cleaned mechanically or otherwise may be picked before loading to remove wood chips, stained pieces and the like. Here, the operator must balance any gain in realization resulting from improved appearance against the cost of such picking, which is high.

Where bony by itself or in combination with good coal is fairly high in percentage, some operators use picking as a means of removing this material, which then is crushed and sold as a power-plant fuel.

Under reasonably good conditions, and where the impurity content is high, one picker can remove as high as 6 tph. Under average or poor conditions with a lower impurity content, production may drop to 1 to 2 tph. This relatively low production at rather high cost is in part responsible for the trend toward crushing everything to, say 6 in, and conversely toward raising the top size mechanically cleaned up to 6 to 8 in, and more recently up to 12 to 14 in. However, under proper conditions, hand picking still can provide economical results, especially if appearance is a major consideration. Also, it may be a good form of rough cleaning, which includes, as in



anthracite, "reverse picking," where coal is picked out of the rock.

Hand picking can result in a substantial loss of coal values unless provision is made for treating the pickings. The usual practice is to crush the pickings and run them to mechanical cleaners if used. If mechanical cleaners are not used, pickings, as previously noted, may be crushed and loaded as power plant fuel, especially if there is a percentage of high-Btu bony present for an added incentive. Of course, big lumps may be split or broken by the pickers themselves to salvage the coal, though this is an expensive procedure in view of present-day labor costs.

PICKING EQUIPMENT

Picking facilities include belt and apron conveyors, shaking tables and, occasionally, chain conveyors, the latter normally being employed only under special conditions and where the impurity problem is a minor one. All conveyor-type units lend themselves to combining the table with the loading boom.

The flat-topped apron conveyor and the shaking table best meet the major goal of removal of impurities without lifting or other handling beyond sliding the material removed to the discharge point. Other types of conveyors normally require skirtboards over the rollers or along the edges and thus necessitate lifting each piece to remove it.

The flat table may be a part of the shaking screen or may be separate. When separate, the table normally is sloped at about 5 deg and is operated at 150 to 160 rpm, 4- to 5-in stroke, crank or eccentric drive. Platform tables used in anthracite have a pitch of ½ to ¾ in in 12, with a 2-in stroke, 370 to 400 strokes per minute. The shaking table also lends itself readily to degradation removal by the installation of a screen section at the discharge end.

Some shaking tables have been equipped with partitions or deflection plates to further ease the load on the pickers by making it possible for them to do no more than push impurities out of the main stream to the center or pull them to the side, where the motion of the table carries the impurities to the discharge opening. Refuse chutes should be equipped with bars to prevent passage of pieces large enough to block the refuse conveyor.

In addition to elimination of lifting, factors contributing substantially to the efficiency of the picking operation include the following:

1. Depth of bed not exceeding the size of one piece.
2. Even flow with a speed of travel not over 80 fpm, and preferably between 30 and 60 fpm.

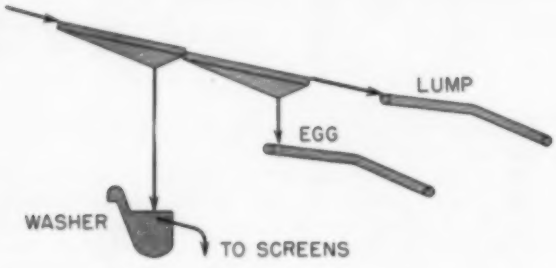
3. A width so that a man does not have to reach more than 30 in from the edge.

4. Height of approximately 32 in above the place where the man stands.

5. Spacing of at least 4½ ft between pickers, including the refuse chute.

6. Chute tops flush with table top and equipped with backboards to make it unnecessary for the picker to take his eyes off the table and permit him to use both hands.

7. Washing



Washing is a form of mechanical impurity-removal, or cleaning. Mechanical cleaning is growing because it has these definite advantages:

1. Mechanical cleaning is the only form of cleaning providing effective results on the finer sizes of coal.

2. A mechanical cleaner, properly adjusted and within the limits of its characteristics, provides the maximum in product uniformity—a major factor in market acceptance of the product.

3. Mechanical cleaning cuts labor cost per ton to the minimum and thus, compared to hand picking—at least in certain sizes—can sometimes reduce over-all preparation cost for a real cleaning job substantially.

What actually happens in the separation of coal and impurities is a complex and to some extent unknown physical process. Particle size and shape are involved, as well as the resistance of the medium used to movement of particles through it, and the fact that coal is cleaned as a mass of particles, with consequent interference between free movement of particles within the cleaning medium. In the main however, separation is accomplished as a result of the difference in specific gravities of the coal and impurities in combination with the buoyant effect of the separating medium. In other words, where buoyance or its equivalent is present, the heavier particle will sink and the lighter will float, or the heavier will sink faster than the lighter.

The intensity of the buoyant force is expressed in terms of specific gravity. A high specific gravity means that a given separating medium will float a heavier particle. In other words, it is more buoyant. Starting with water, for example, specific gravity may be increased by adding a chemical to convert it into a solution, such as, the zinc chloride solution used in float-and-sink tests.

The majority of the coal to date, however, is cleaned by imparting an effect of higher gravity to water by setting it in motion—in other words, artificial gravity. The motion may be up and down, or jigging; continuous upward flow, as in classifier or upward-current washers; or stream, as in trough or launder washers. The goal in all is stratification of the raw coal with the heavy material, or impurities, on the bottom so that it may be split out by various methods. In addition to stream flow, motion may be used to facilitate stratification and separation, as on the coal-washing table. Air is substituted for water in pneumatic cleaners, and much the same principles of imparting an artificial gravity to it are employed.

True or artificial solutions, however, are increasing in use as separating media. The processes employing them are known by such terms as heavy media, dense media, heavy density, and so on. An example of the true solution used for some years is calcium chloride, normally accompanied by a slight upward current. For the most part, the effect of solutions is obtained by suspending sand or magnetite in water. Since the ideal condition for separation of coal and heavier refuse is a still bath of the proper gravity, and since the true or artificial solutions comes closer to this condition, the sharpness of separation is increased—an added advantage where the separation problem is difficult.

A good indication of the difficulty of separation is the amount of material in the raw feed that lies close to the gravity of separation. In other words, the greater the percentage of near-gravity material, the more difficult, as a rule, the separation. A good indication of the efficiency of a cleaning operation is the quantity of misplaced material—coal in the reject and reject in the coal. To apply this measure, however, the inherent ability of the cleaner itself to separate coal and refuse must be known, since cleaners vary in their ability to achieve a given separation. Evaluation of this ability is a somewhat complex process, but methods of achieving it include those discussed in "Evaluating Preparation Results," *Coal Age*, April 1950, p 80.

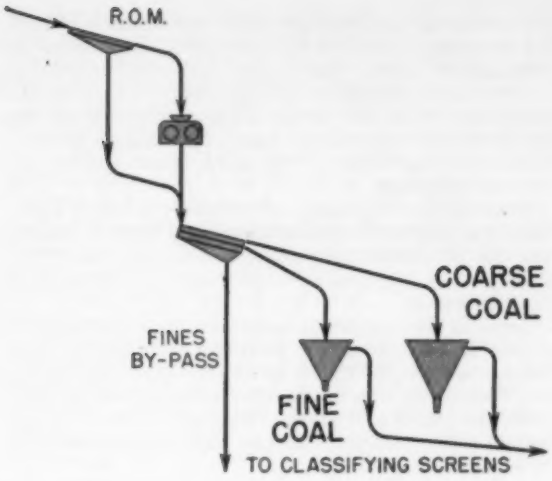
In the main however, if the washer is properly selected, is kept in adjustment, and is properly operated (see suggestions later in this section) it will provide the requisite separating efficiency. Basic in selection is detailed knowledge of the characteristics of the constituents of the feed. First of all the sample must be representative of what the washer will be called upon to handle. Then screening, sink-and-float testing, and construction of washability curves will show what can be accomplished under what might be called ideal conditions. Where it is evident that the problem may be difficult and the maximum in efficiency is desired, it may pay to wash sizable tonnages in pilot equipment or actual going plants to check test results. The results of washing a new coal may also be predicted by mathematical or statistical methods, such as that described in "How to Predict Results of Washing a New Coal," *Coal Age*, June, 1952, p 98.

WASHING PRACTICE

Factors in the application and operation of washing equipment include the following:

Size Spread in Feed—Certain types of washers require a rather small range in the size of the feed. Examples include the mechanical jig, classifier-type units, and certain washers using heavy media. The emphasis in design in recent years, however, has been toward equipment that will handle a rather large range of sizes—for example, the air-pulsated jig and the usual heavy-media equipment. The latter, incidentally, is now offered for handling a top size of feed ranging to 12 to 14 in.

Even where the washer is designed to take, say, all coal from 6 in down to zero, and can frequently do a good job on all the fractions in such a feed, some compromise must be made. In other words, somewhere along the line, the separation efficiency is less sharp—perhaps



at the fine-coal end and perhaps at the coarse, depending upon washer design and adjustment. Consequently, if tonnage is fairly high and a sharper separation is desired throughout, the practice is to install separate units for the coarse and fine fractions—for example one for 6x1 or 4x1, and a second for 1x0. Where the equipment requires a closely sized feed, the only out is to install separate units for each fraction it is desired to clean.

By-passing Fines—Fine coal, say ¼ in or less, may be by-passed around washing equipment for several reasons: (1) to keep it out of water and thus avoid the ensuing drying and handling complications, (2) to permit more efficient operation of washing equipment installed to handle a rather wide size range, and (3) because of the problems involved in mixing of fines with medium, such as, sand and magnetite. The fines may be subjected to further treatment in other units or other types of equipment or, if both their quantity and ash content are not too great, may be mixed back into the washed coal. Retreatment, however, is necessary, if remixing the fines substantially increases the ash content of the final product or results in excessive variations from the desired impurity figures.

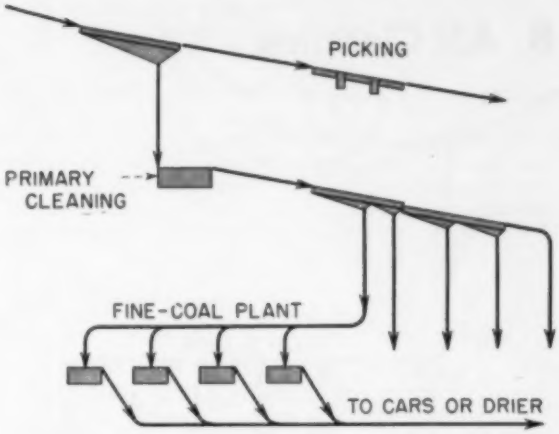
Uniform Feed—A uniform feed, both in quantity per hour and in impurity content, adds measurably to the efficiency a washing unit can reach. The best method of attaining uniformity in quantity is the installation of some form of surge hopper or bin, plus a mechanical feeder, ahead of the washing unit. Attaining uniformity of impurity content is normally achieved by some form of blending equipment, as discussed in Sec. 2 of this Guidebook. Overloading should be guarded against particularly. While many washing units have a fair margin of excess capacity, overloading to any considerable extent is almost inevitably followed by a sharp decline in cleaning efficiency and in uniformity of product.

Feed Conditioning—Prewetting either in the feed chute or on special prewetting screens facilitates separation when the material reaches the washer, and consequently is finding increased use. Conditioning also is mechanical in nature. The feed, for example, should be uniform across the width of the washing area. Also, under certain conditions, particularly if prewetting is not employed, provision should be made for getting the feed quickly into the bath and to prevent clotting or travel enmasse, increasing the difficulty of separation.

Proper Adjustment—Maximum washing efficiency does not come automatically with the installation of the equipment. Consequently, adjustment is a necessity—and it is necessary to keep a constant check on performance and readjust from time to time as changes warrant.

FINE COAL WASHING

Since mechanical cleaning of the finer sizes, say ¼ in or smaller, presents added difficulties and brings in different factors, special equipment is being increasingly employed for this purpose, although, with proper modification, conventional equipment can be and is used for fine coal. The special equipment includes tables (some designed, however, for top sizes up to 1¼ or 1½ in), upward-current classifiers (also offered for larger sizes), and launders of the free-discharge type.



Other equipment applied to fine-coal cleaning on occasions includes centrifuges and cyclones. Thus, for example, if clay particles or other impurities are concentrated in the lower size range, say 48M, they, plus also the coal in this range, may be spun or centrifuged out through the screen or the cyclone orifice. If the coal loss is not excessive, good results may be attained with certain types of coal. Experiments with the use of a dense medium in cyclones also are being carried out to see if its efficiency as a cleaner can be increased.

FROTH FLOTATION

As coal and refuse particles get smaller and smaller, their ability to move as desired through water or other washing medium becomes less and less until a point is reached where separation cannot be accomplished on the usual basis. The practical line of demarcation is somewhat indefinite, although the minimum so far suggested for heavy media, for example, is 1 mm, with ½ mm as a possibility. At that point, somewhere around 10M or less, a different principle of separation must be employed to get maximum efficiency with reasonable capacity.

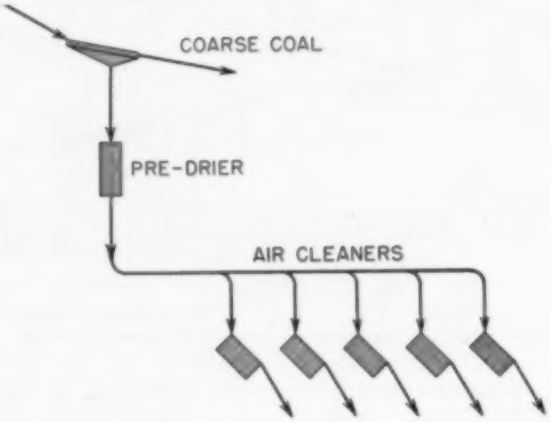
Flotation achieves these goals by adding a reagent to water and then inducing the formation of bubbles. Refuse particles will not stick to the bubbles but coal particles will and are carried to the top of the bath and removed for subsequent dewatering, or other treatment, and loading or mixing.

Facilities involved in flotation normally include a thickener or hydraulic classifier to size the feed, remove oversize, and so on; reagent feeders and conditioners where the reagent and the coal pulp are mixed and "conditioned"; and the flotation units themselves. The flowsheet

also may be modified to include, for example, roughing cells preceding the final treating cells, retreatment units for a coal or primary tailing product from the primary bank of cells, or other modifications.

Feed Conditioning—Flotation, as noted, normally incorporates conditioning in the circuit. Even with other types of fine-coal washers, however, more attention is being given to conditioning the feed. The cyclone and the hydraulic classifier, for example, are employed to deslime or remove extreme fines from the feed to fine-coal equipment. The goal is creation of conditions leading to a higher separating efficiency. The same reasoning applies to such equipment as revolving feed distributors to assure uniformity in the rate of feed to tables.

8. Air Cleaning



The basis of cleaning with air is substantially the same as for cleaning with water or other mediums (see preceding section). Air, however, eliminates or reduces the drying problem, although it involves a dust-handling problem similar to the water-handling and clarification problem involved in wet washing.

Air cleaners normally operate on a fairly closely sized feed and, as with water, the feed should be uniform in quantity and as nearly uniform in impurity content as possible. Moisture variations are particularly troublesome in air-cleaner operation, in addition to the effect—usually less severe—of high surface moistures. In view of this situation, one remedy actually employed at some plants was to spray the raw feed. Thus, while moisture content was increased, the disadvantages were less than the advantages derived from greater uniformity.

Present practice in eliminating the effects of high moisture and lack of uniformity in table feed is to pre-dry, and a number of plants recently built include pre-drying equipment of the heat type. At the same time, if total moisture in the mine product normally is high, the operator gains the sales advantage of a minimum moisture content in the shipped product. Increased moisture in the raw product, incidentally, reflects the growing use of water at the face.

The majority of the air cleaners installed today operate on coal ½ in or less in size, though larger coal is treated. From the standpoint of the drying problem, washed coal over about ¼ or ½ in may be dewatered sufficiently for acceptance—at least in many instances—which is in part the reasoning leading to the installation of combination wet and dry plants. And if mine conditions or mining practice make drying of fines desirable, it may be accomplished to the advantage of the air-cleaning process by pre-drying as previously noted. Normally, 2 to 2½% surface moisture in ⅜- or ¼-in coal is about ideal for air-cleaning efficiency.

Since air-cleaning equipment normally is highly sensitive, care must be devoted to adjustment both in installation and in operation. Air supply and distribution are the major factors. Continuous observation of the products is recommended.

Most air cleaners now installed are three-product machines, and thus normally provide a middlings product for retreatment. The goal in this middlings production and retreatment is maximum efficiency in separation with minimum loss of coal values. Dedusting to remove up to 50% or more of the fines—usually 48M—adds significantly to air-cleaning efficiency.

DUST COLLECTION

Every air-cleaning plant should be provided with an adequate and efficient dust-collecting system—not only for better operation but to prevent the emission of large volumes of dust into the air. Equipment for dust collection includes the following:

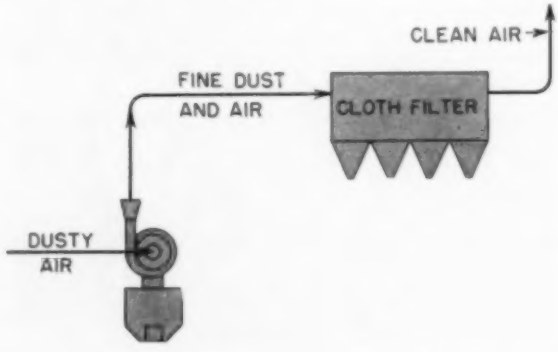
1. Large expansion chambers into which the dust-laden air is routed to permit settlement. However, such chambers can trap only the larger particles. Smaller baffled units are employed, however, for scalping ahead of other equipment such as cloth collectors.

2. Cyclone collectors. These centrifugal units are a popular means of removing dust from air. Since single units handling large volumes are less efficient because of reduced air velocity, multiple and tandem units are offered, raising separation from, say, 85 to 95%, up to 98%.

3. Turbo-centrifugal collectors. Turbo-type units, usually termed "clones," offer the advantage of smaller size as a general rule. Like the standard cyclones, they are relatively inexpensive to buy, are easy to operate and are low-maintenance units.

Even at 98% separating efficiency, the quantity of very-fine dust that can still escape to the atmosphere can run up to several tons per day. To trap the most of this remaining fine dust, cloth or bag-type and wet-type collectors are employed.

Of the cloth-type collectors, the bag type was one of the first to be installed at coal-cleaning plants, normally with a shaking device to remove the accumulated dust. A more-recent development is the cloth-screen collector, which provides larger capacity per unit of space oc-



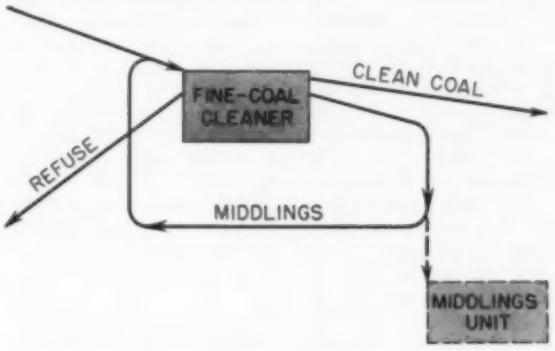
cupied, is easier to inspect and maintain, and is provided with an improved cloth-shaking device. To prevent interruptions while the dust is being shaken off the units, dual-unit, or continuous cloth collectors may be installed, the air being directed alternately from one to the other.

Exhaust operation of dry-type equipment keeps the dust within the ducts and equipment in case there are leaks. Disposing of the dust requires care to see that it is not again dispersed when it is being dumped. One method is to run it into a final wet-type unit to convert it into a paste or slurry. Acid, abrasion and the like are factors to be considered in the operation of cloth-type filters, and require special cloths and other measures to get normal life.

Wet-type collectors include the tumbler; a combination of turbo-centrifugal unit and water sprays; and the hydrostatic. All have the advantage of high capacity in relatively small space, in addition to a high separating efficiency as a result of the use of water, particularly in the tumbler and hydrostatic units, where the dust-laden air is passed through a water bath. Both units have no moving parts.

Various types of dust-collecting units may be used alone or in combination—for example, cyclones followed by cloth collectors or wet units.

9. Retreatment



PURPOSE: Increase the ability of the washer to do a sharp separating job by relieving it of part of the load, particularly where the percentage of near-gravity material is high and consequently the cleaning problem is more difficult.

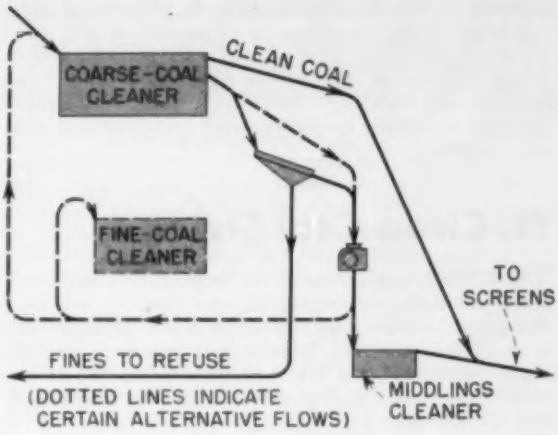
Steps in the retreatment of coarse coal are as follows, starting with a product from the primary washer draw or a special middlings draw:

1. Preliminary screening of the product at 2 in or other limit.

2. Crushing of the oversize to the screening limit to release the impurities.

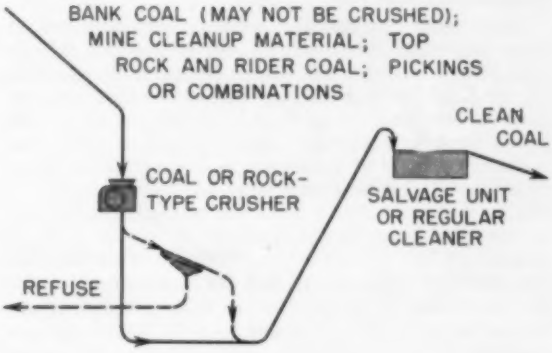
3. Recirculation of the crushed product to the washer or to a separate retreatment unit. Separate retreatment units are employed where several units handle primary cleaning or where, even after crushing, the recirculated product contains considerable material close to the washing gravity.

With the smaller sizes, particularly less than, say, about ¼ in, where crushing is often less effective as a means of releasing the coal values, the entire draw product may be recirculated or retreated in a separate unit. This is particularly true in air-cleaning coal under approximately ½ in.



The value of this method of enhancing cleaning efficiency and reducing coal loss is evidenced by the increasing use of separators designed to produce three products: clean coal, middlings and refuse. This has been particularly evident in cleaners of the heavy-media type.

10. Salvage



PURPOSE—Reclamation of coal that otherwise would be lost because it never gets to the preparation plant, or because the preparation system is set up to reject it without an opportunity to get it back.

Examples of salvage operations include the following:

1. Crushing and washing of pickings, either in regular or special units, to save coal values.

2. Picking out, crushing and loading separately for steam coal a bony product that might otherwise go to refuse.

3. Processing of roof brushings, track cleaning and the like to recover a regular or a steam-coal product. As an example, one plant producing metallurgical coal set up facilities for treating top brushing, which included a rider seam, the product being used for steam raising. Normally, the production of such material should be sizable to warrant separate facilities.

Another form of salvage, widely practiced in anthracite and to a limited extent in bituminous, is reworking

contents of old refuse banks and silt ponds or dumps.

Salvage operations ordinarily are carried on with conventional screening, crushing and cleaning equipment. Exceptions include the use of rock-type screens and crushers, and extra-large draws on cleaners where mine material or pickings containing large percentages of rock are processed.

11. Clean-Coal Sizing

PURPOSE: Separation of the product of cleaning or other processing operations into the final or semi-final size group for loading or for loading plus additional treatment of a certain size fraction. This treatment may include rescreening, crushing and rescreening, and so on, plus mixing and blending, discussed in later sections of this Guidebook.

Clean-coal sizing, or classification, is handled by both shaker and vibrating equipment, the latter having made substantial gains in this field as well as in the field of raw-coal sizing. Certain factors involved in clean-coal sizing are substantially similar to those in raw-coal sizing (Sec. 5). In addition, accuracy becomes vital, not only because of its effect on the buyer but also because inaccuracy can materially affect realization by putting larger sizes into smaller. This in turn brings in questions of plate and cloth wear, blinding, and so on. Also, screening should be done to keep degradation in the process to a minimum.

ACCURACY FACTORS

Aside from moisture and blinding, accuracy involves time the coal is on the screen surface, and also cloth or plate wear. Time on the screen brings in the question of breakage, or degradation, which increases with increased screening time, though, as in anthracite, the hardness of the coal may permit a longer retention time without increase in breakage. Of course, other things being equal, sufficient time must be provided to permit the smaller sizes to work down and be separated out, and in turn this brings in the question of bed thickness. It should not be excessive if good screening is desired, and the smaller the opening, the less the bed thickness should be if excessive length of screen is to be avoided. Where one of the products is screenings and the feed to the unit includes all sizes up to lump, depth of bed should not be more than 4 to 6 in, and screening efficiency and capacity may be increased by placing a large-hole relief screen over the slack section.

The relative ease or difficulty of screening a certain feed at a certain size, which in turn is one measure of the screen area necessary for accurate separation, reflects in the main the quantity of near-opening material in the feed. If there is a substantial percentage of material at or slightly larger than the opening size, particles smaller than opening size find it more difficult to work down through the bed of near-opening material, and also there is a greater chance that particles only slightly undersize will be carried beyond the screening surface before they have an opportunity to go through. The difficulty increases as the size at which screening takes place decreases.

SCREEN WEAR

Plate, cloth and wire wear reflect load, screening time, abrasive nature of the material, corrosion if the water is acid, and the material used in the screen. Where plain-steel plate is employed, increasing the thickness is one way of offsetting the effects of wear but brings in a significant decrease in screening efficiency. Consequently, operators turn to bronze and alloy steels, with stainless coming rapidly to the front in recent years for the smaller sizes. However, as a general rule, stainless life must be 10 times plain-steel life to justify its use for wear-resistance alone, and therefore bronze or other alloys are favored for heavy plate. With round-rod or wire-screen screens, or with special-profile bars, wear is largely on the top and consequently the period of reasonable accuracy is materially lengthened.

Small-opening punched plate must be relatively thin, both to facilitate the punching operation and because excessive thickness, as previously noted, affects screening efficiency. Consequently, additional support is required to prevent sag and wear. Bars under the plates are the preferred method. An alternative is the Peristertread screen—a stepped-type unit in which the risers provide the extra support while the screening is done on the treads. Bars or other supports also are installed under the cloth on vibration screens for the same purposes.

Elongated openings frequently are employed instead of round or square. Among the goals are: (1) increased screen capacity, (2) reduced blinding and (3) less breakage with friable coals. However, replacing conventional screens with long-opening units, with no change in the effective width of opening normally increases the size of the through product. In other words, it enlarges the effective opening.

A special form of screen is the lip type, usually with a greater width at the lower end. It provides a tumbling effect and this, together with the type of opening, normally results in an increase in capacity of up to double or more. At some plants, this characteristic has resulted in installation of lip screens to offset a condition of chronic overload. Incidentally, overloading severely affects screening efficiency. For maximum accuracy, feeders or other devices should be provided to insure uniformity in rate of feed to screens.

Use of elongated, lip and similar screens brings in the factor of separation by shape as well as by size. Consequently, the products are quite different in character, with considerably more flats in the underproduct with the elongated-opening units.

Excessive flats may be considered a detriment in coal for domestic use. Anthracite is confronted more with this problem than bituminous. Flats may be picked out by hand or, where the quantity is large, mechanical pickers may be employed. These may consist of angles with a gradually increasing opening from feed to discharge end; small-diameter motor-driven rolls (several side by side); and special punched plate with narrow slots into which flats will slide but not the normal lumps.

BLINDING—CAUSE AND ELIMINATION

Blinding in coal screening occurs with all sizes but is particularly annoying and most affects efficiency with the smaller material. Blinding reflects in the main the percentage of particles near the size of the screen opening and especially, as the size of the coal decreases, surface moisture.

Additional factors tending to increase blinding include overloading and the presence of clay and shale mud. As a rough rule, a surface moisture of 6% will result in complete or nearly complete blinding at separations of ¼ in or smaller. At 2% or less, little or no blinding occurs.

Aside from blinding, moisture also tends to increase the inaccuracy of screening by causing small particles to stick to larger pieces. Where washing is done, one of the functions of sprays on classifying screens, in addition to opening up and agitating the bed to facilitate separation,

is washing the fines off the large pieces and through the screen.

The building up of a film of moisture and packed fine material is held to be the major cause of blinding in fine-coal screening. Time is a second major factor. Rust and corrosion with plain steel also can cause major blinding difficulties, especially after the screen has been idle for a time.

Electrical heating is rapidly growing as a means of preventing blinding of screen cloth. Other methods applying to cloth, plate or both, include:

1. Alloy metals which resist wetting and film buildup.

2. Use of plate, wire and cloth impervious or less subject to rusting and corrosion.

3. Use of large openings, though this brings in the risk of throwing more oversize into the through product.

4. More screen area or a lower feeding rate with higher moisture.

More fundamental, perhaps, are mixing and blending to achieve uniform surface moisture or predrying of moist or wet material.

Screen Heating—Heating cloth electrically is rapidly growing as a means of preventing blinding. Most screen manufacturers are now in position to offer designs applicable to practically all types of screens. In addition to eliminating blinding and its attendant effects, including the necessity of increasing screen opening, heating also offers two other advantages:

1. Increased screen output—up to 50% or more.

2. Longer screen life—up to 4 or 5 times in some instances. Also, some operators have found that they can get increased life with smaller wire and less costly cloth.

Cost of equipping a screen generally ranges from around $800 for a screen of 20 sq ft up to $3,000 for 96 sq ft. Cost of power in many installations is 0.3 to 0.4¢ per ton of feed to the screen. Power demand reflects the screening problem and the size of the heating unit, which ranges from 10 to 30 kva. Heating, however, like other methods of preventing blinding, will not prevent wedging of near-size particles in the cloth nor clogging when the depth of the bed on the screen is greater than recommended practice.

DEGRADATION REMOVAL

Screening out of small pieces resulting from breakage in processing, sometimes called rescreening, can take place at convenient points in the operation. Usually, however, it is done immediately ahead of the loading boom or chute, generally by a separate section of screen in the sizing shaker or in the chute leading to the boom. Where scraper-type booms are employed, they may be fitted with a fixed screen near the end, the fines dropping through to the lower strand for return to the slack or screenings circuit. And where coal is loaded by chutes from storage bins or pockets, fixed sections of plate may be installed in the chute bottoms for degradation removal.

12. Dewatering and Drying

PURPOSES:

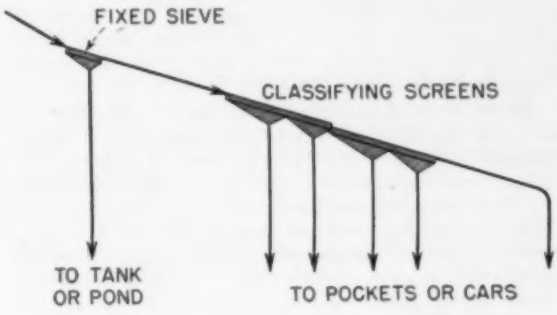
1. Reduction of moisture in the final product and enhancing the benefit to the consumer, particularly in the industrial category, by raising Btu content, reducing freight cost, or better fitting the coal for such uses as the production of metallurgical coke.

2. Elimination of freezing difficulties.

3. Preparing the coal, by such methods as predrying, for added efficiency in screening, air cleaning and the like, while at the same time securing Benefits 1 and 2.

The problem of dewatering and drying normally involves only the removal of "surface moisture." However, with some types of coal—usually in the lower ranks—heat drying occasionally will affect "inherent moisture" to some extent, and in drying lignite for final use or as a raw material, the goal is reducing the inherent percentage. This section, however, is limited to the usual job of removing surface moisture. The methods include natural drainage; mechanical dewatering with screens, centrifuges and similar equipment; and heat drying.

Because the surface area on which moisture can collect increases rapidly with reduction in size, dewatering presents a greater problem with fines. As a rough rule, natural drainage will reduce the moisture on coal above ½ in and perhaps down to ¼ in to a point where there will be little or no freezing except in very severe climates. However, it may be desirable to reduce the moisture still further for the reasons set out at the start of this section. Below ½ or ¼ in, freeze prevention requires specific dewatering methods and equipment.



NATURAL DRAINAGE

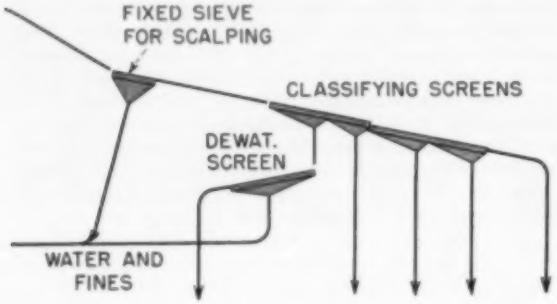
Equipment employed in dewatering by natural drainage includes hoppers and bins; inclined and horizontal conveyors with screens in the bottom; perforated bucket elevators; and fixed screens. Fixed screens in flumes from washers to classifying screens, in fact, are widely used for unloading a large part of the water.

The fixed-screen principle for unloading or reducing excess water has been developed into special types of units both here and abroad. The launder screen recently developed for anthracite is made by placing 6-in-high partitions every 6 in along a chute or launder pitched at ¾ to 1¼ in per foot. Screen cloth is tacked over the compartments, which are drilled in the bottoms to receive pipe bushings. Only a small percentage of the water and fines is removed in each compartment, resulting in more-even water distribution over the entire screen surface. Also, the bed is maintained in fluid condition, resulting in high screening efficiency.

A combination of "partitioned" and "radial" screens is used abroad for preliminary dewatering of minus ¼-in coal prior to centrifuging (*Coal Age*, September, 1953, p 95). High efficiency with high capacity are claimed for the combination. Belts, as at one U. S. plant, may be used for removing a portion of the water by natural drainage. The belt may be humped in the center, or may be inclined with the coal placed on the side to permit the water to run back over the tail pulley.

For coal larger than ¼ or ½ in, dewatering by natural drainage is quick and complete, and the product, as noted, normally will not freeze unless the cold is severe and lasting. Where the finer sizes are involved and freezing is a consideration, the problem becomes more difficult. However, natural drainage of coal as fine as 1/16 in and 28M to surface moistures of 10 to 12% is being achieved with flotation coal.

The method followed by one anthracite producer, as an example, involves siphoning water off the tops of loaded cars and special caulking of the doors to facilitate draining through the bottom. The process is helped by the flotation reagent remaining on the coal, which facilitates runoff and acts to retard freezing in cold weather.



MECHANICAL DEWATERING

Omitting such processes as thickening and the like (see Sec. 19), mechanical dewatering, frequently set up to complete the job in one pass, is done by screens, centrifuges and various forms of filters, the latter including the high-frequency electrically actuated vibrating type. With all, the dewatering process, as with fixed screens, normally involves producing a through product which must be loaded wet, discarded or treated by other means. Some special forms of mechanical dewatering include squeezing flotation coal on a belt conveyor by means of an idler pulley.

Shaker Screens—Conventional shakers of course accomplish dewatering, but when dewatering is the specific goal the tendency is to go to special screens, usually flexible-board-hung or supported and operated at speeds of 150 to 400 rpm, with short throws of around 1 in. Anthracite shakers intended for both dewatering and sizing tend to operate at nearly conventional speed and stroke but with only a slight inclination, usually ¾ in per foot. For dewatering only, the speed is increased to 200 to 400 rpm and the throw is cut to 1 to 1½ in, especially for the smaller buckwheats.

Plate or cloth may be used in dewatering the larger sizes, and plate also is employed for a substantial portion of the smaller sizes in anthracite. In bituminous, however, when dewatering at, say, 28 mesh, the tendency is to use cloth, rod or wedge wire.

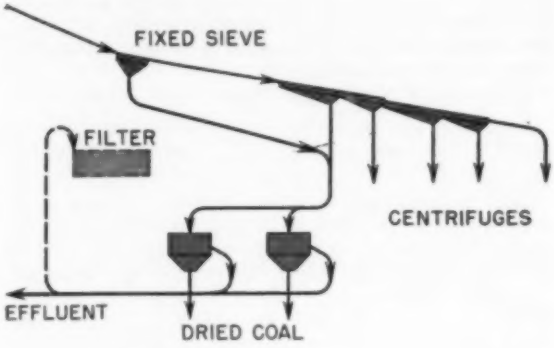
When used for dewatering, the shaker-type screen normally will reduce the surface moisture of sizes above approximately ¼ or ⅜ in to 5% or less. When dewatering smaller sizes at, say, ½ mm or 28M, surface moistures of as low as 3% have been obtained, but the range usually is 5 to 10% and higher.

Vibrating Screens—The use of vibrating screens for coal dewatering has shown a major increase in recent years, partly reflecting their higher capacity. Both the conventional and special types are employed. One class of special screen is the flat or upwardly inclined type. In both instances, one result of the design is longer retention and greater agitation of the coal to increase the dewatering action. Another class is provided with dams to hold the coal on the screening surface for a sufficient period to insure maximum water removal.

Dewatering results reflect size of coal handled. Where the average size of the feed is around 5/16 in, a surface moisture of 5% normally can be attained, and in many instances much less. Final moisture increases with reduction in size up to 25% or more with, say, 28 or 48M material.

Centrifugal Screens—Now being offered by both dry screening and dewatering of the smaller sizes, the centrifugal screen provides results down to as low as 2 to 3% for coal approximately ¼ in in size in some instances, and normally around 5%.

Scalping Service—All types of screens and natural-drainage units may, of course, be used to scalp off part of the water before the coal goes into centrifugal or heat-drying equipment. And by the same token, the feed to screens may be scalped by settling tanks and similar facilities, thus again relieving the burden on the following units and raising their capacity and efficiency.



Centrifugal Driers—Centrifugal driers commonly used in coal preparation are usually divided into the screen and solid-bowl types. They normally operate on coal less than ½ to ¼ in in size and provide surface moistures of 5 to 7%, sometimes higher and sometimes lower depending upon the size and other characteristics of the feed. Unit capacities range from 20 to 75 tph, as a rule. Coal loss in centrifuging, again depending upon size consist and character, generally is 20 to 30% of the feed, sometimes less and sometimes more.

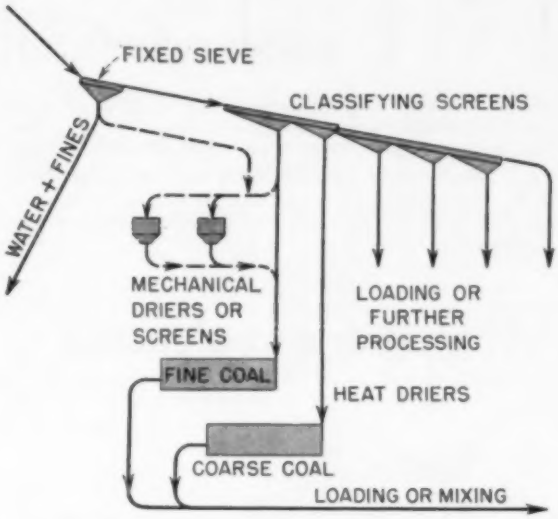
Centrifuges may be employed for the complete dewatering job. However, there is a tendency to use the centrifuge as a scalping unit ahead of heat-drying equipment, thus simplifying the heat-drying job.

Filters—With the increase in pressure to reduce stream pollution, and also as a result of the growing use of other types of mechanical dewatering equipment producing effluents containing fine material, there is an increased trend toward the installation of filters of the continuous-vacuum type. As a corollary, a solid-bowl centrifuge especially designed for the service, known as a "polisher," is used for the same purpose.

Filters receive feed from settling tanks and thickeners, directly from wash-water sumps, and as effluent from other types of mechanical dewatering units. Common combinations are a centrifuge and a polisher or a thick-

ener and a vacuum unit. With the vacuum type, flocculation of the fine-coal particles by means of caustic starch or some other agent increases filter capacity and reduces moisture in the final cake, which may be loaded directly or, in some instances, heat-dried alone or in combination with larger sizes.

Final surface moisture of the filter product is held to reflect largely the moisture in the feed, the percentage of minus 200M material and the ash content of the dried product, though feed moisture apparently is less of an influence than the other two factors. Depending upon percentage of fines and ash, surface moisture in the product ranges down to as low as 15% and up to approximately 30%, with some exceptions both above and below.



HEAT DRYING

Heat drying is about the only way to get surface moisture of as low as 2 to 3% consistently, particularly with the finer sizes. In this process, the coal is subjected to hot gases at temperatures slightly above the temperature at which volatile matter is distilled off of the coal. Time is a major factor in preventing distillation, or cooking, of the coal, and consequently the aim is to keep it as short as possible, though longer periods are possible with reductions in temperature.

Types of heat driers used in coal mining are:

1. Rotary, with either inner and outer shells, or an outer shell with lifting vanes inside.

2. Screen, involving a reciprocating screen as the carrying medium. In most instances, the gas is pulled down through the bed and the drying action is of two types: evaporation and, to some extent, mechanical as a result of the screening action and the scrubbing action of the gas. When the gas flow is interrupted by an appropriate valve and then is resumed, squeezing also takes place. As the coal gets finer, evaporation becomes relatively more important, and consequently, fine-coal screen driers are designed for longer coal retention as a rule. New designs include a step between the two screens to turn the coal over.

Depending upon size of the unit and also the size of the coal, capacities of screen-type driers normally range from 25 to 125 tph of dried product.

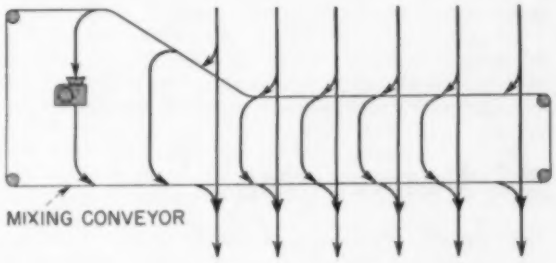
3. Cascade, in which the coal flows in steps down through a vertical shell, resting for an interval on each shelf or step in one type and on a bottom shelf in another.

4. Conveyor or carrier, in which the coal is moved through a hot-gas chamber on a perforated carrying strand or a wire-mesh belt. One type provides two stages of drying with both up- and downdraft gas flows, the down being the second stage and designed to permit maximum mechanical dewatering through the wire-mesh belt. The coal bed in the second pass also acts as a filter to catch dust from the first pass.

5. Suspension, in which the coal is introduced into an upward-flowing stream of gas. In one type, the coal is placed in the gas at the bottom of a drying column. Drying takes place almost instantly and the coal is separated out in a cyclone collector equipped with a rotary discharge valve. In another type, the coal flows down over the flights of an inclined conveyor and at the same time is moved sideways to the discharge point. Housing design is such that only the smallest particles escape from the chamber. Both driers are widely used for the finer sizes of coal.

Dust Suppression—Dust is a problem with practically all heat driers, and particularly with those handling the smaller fines. Cyclones are the first line of defense and may be supplemented by bag-type collectors, wet collectors and water-spray systems (see Sec. 8). High temperatures and high moistures in the spent gas have militated against the use of bag collectors in some instances and resulted in adoption of wet or wet-and-dry (tumbler-type) collectors. The problem of disposing of the collected material has been solved in at least one instance where water-spray equipment was installed by cleaning it in flotation equipment and dewatering it on a vibrating screen.

13. Crushing



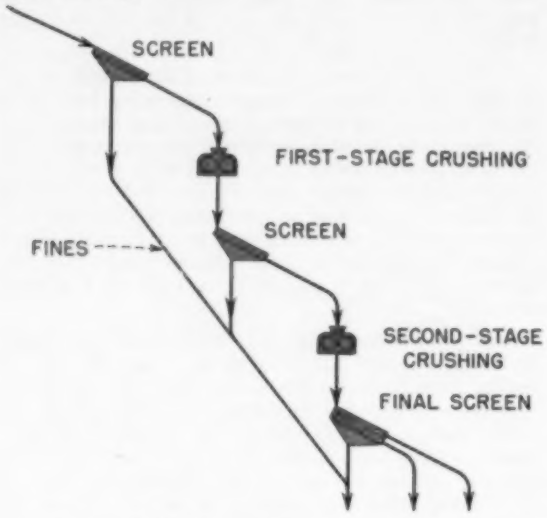
PURPOSE: Conversion of unwanted or slow-moving natural coarse sizes into smaller sizes desired by the market, as distinguished from crushing for process purposes, such as middlings retreatment.

Although crushing or breaking for market purposes can take place in the preliminary processing, as in reducing the top size in the mine-run feed to a certain dimension, the majority involves specific sizes after hand picking or other cleaning, and the goal usually is the production of stoker or other smaller sizes. An exception is anthracite, where practically all of the breaking is done in one or more stages before the coal goes into the cleaning units.

In bituminous plants, a favorite place for cleaned-coal crushing equipment is between the top and bottom strands of the mixing conveyor. This permits a wide flexibility in the sizes that may be run to the crusher, and

also provides a convenient means of getting the crushed product back to the loading point, especially when the product is loaded without further sizing or other treatment.

Crushing may be—and frequently is—a part of a breaking and rescreening cycle for the production of double-screened stoker or other sizes, such as pea (see "Rescreening," Sec. 14).



A major goal in clean-coal crushing operations—or, in preliminary breaking for the same purpose (Sec. 3)—is reduction to the proper size without excessive production of fines. Crusher design is one answer, and types and models now available permit good attainment of this objective. Operation is another answer and, among other things, involves stage crushing with rescreening between each stage. Some plants use as many as three or four crushers in series with vibrating screens between to unload the fines, which otherwise would result in increased grinding and pulverizing.

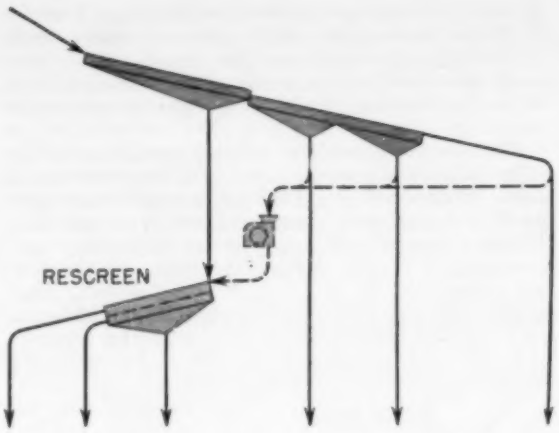
Flexibility in sizes shipped may involve considerable labor and loss of time in varying crusher openings. New models provide gear mechanisms for attaining such changes quickly and while the crusher is in operation.

14. Rescreening

PURPOSE: Production of additional and sometimes special sizes not normally provided by the regular sizing equipment.

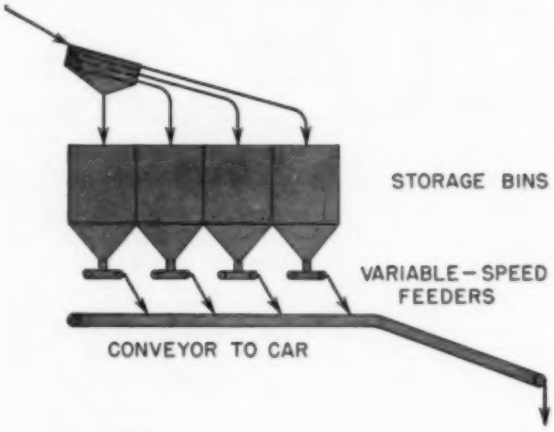
The growth of the domestic stoker was in large part responsible for the growth of rescreening in the bituminous field. With a longer size list, anthracite, in contrast, had no need to change its practice, beyond doing additional crushing, to satisfy stoker customers. Making bituminous stoker normally involved at least dedusting or the removal of fines under, say, ¼ in. Also, many mines going into stoker had the problem of making a product with a top size of ¾, 1 or 1¼ in out of, say, 2-in screenings. Thus, rescreening received a large part of its momentum and the process then was broadened to provide what might be called specialty sizes for other purposes.

The vibrating screen, normally receiving its feed from the main sizing shaker, is the most-used type of rescreening unit in the bituminous fields. Air also has been used for dedusting at, say, 48M, in making the smaller stoker



sizes. Rescreens also are quite commonly hooked up to receive material from cleaned-coal crushers when the natural output of the mine is not sufficient to meet stoker and other specialty demands. Over and through products from rescreening may be sold as separate grades but more commonly are run into slack and screenings shipments for industrial purposes.

15. Mixing and Blending



PURPOSES:

1. In blending, to achieve a high degree of uniformity of ash, sulphur and other constituents in the finished product. Blending is done mostly where metallurgical coal is involved and, as noted in Sec. 2, is accomplished largely at the raw-coal end. However, some metallurgical plants also blend the cleaned product a second time before loading.

2. In mixing, to provide sizes better tailored to the needs of the consumer.

Most of the mixing is done on the old reliable mixing conveyor. Unless crushing is introduced into the circuit, the mix is a natural one—in other words, the sizes in the mix are present in the percentages they naturally come from the final sizing screen.

"Prescription" mixing is a relatively new method of achieving a size consist in line with the customer's de-

sires. A major advantage is that the consists can be absolutely accurate and also absolutely uniform from day to day or shipment to shipment.

Prescription mixing normally is limited to the smaller sizes designed for industrial or domestic-stoker use. It involves placing the various sizes in separate bins. The sizes may be as they naturally come from the sizing units, or they may be produced in part or entirely by preliminary crushing and rescreening facilities. Mixing normally is achieved by feeding the sizes onto a gathering belt ending in a boom section. The rate at which the sizes are fed out of the various bins establishes the percentages in the mix. This rate may be adjusted by adjusting gate openings, but is considered less accurate than special feeders equipped with variable-speed drives.

16. Dustproofing

PURPOSE: Preventing the emission of objectionable volumes of airborne dust at the point of consumption by making dust and breakage resulting from handling and storing stick to the larger pieces.

The principal materials used for dustproofing coal are oil, calcium chloride and special chemical compounds, usually containing calcium chloride with other substances added. Calcium chloride and other chemicals and materials, including cornstarch and molasses, paper-making by-products and so on, pick up water from the air and thus provide a moist surface to which the dust adheres. Corrosion-inhibitors may be added to the chemical-type dustproofing agents to prevent possible attack on metal firing equipment and coal-handling parts.

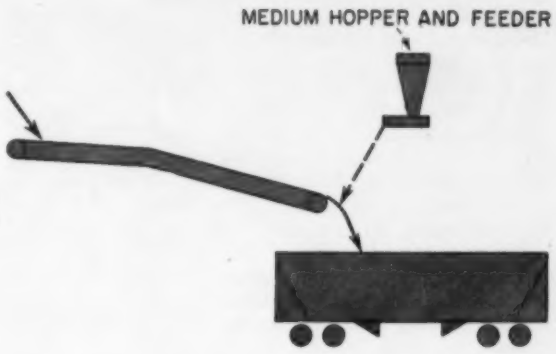
Spray oils for dustproofing are available in a wide range of characteristics to fit the job being done. Equipment for applying them includes both heating equipment for spraying hot, and high-pressure atomizing, or "cold-oil" equipment, for spraying cold. With the hot-oil systems, the oil-carrying lines may be paralleled by heating lines carrying steam or hot oil to keep the oil at the proper temperature at the point of application.

Quantity of material necessary to achieve a desired degree of dustproofing depends upon both the size and type of coal being treated. Since the treatment is a surface job, and the surface to be treated increases as the size of the coal decreases, more material must be applied to the finer sizes. Porosity and other mechanical characteristics of the coal also influence both quantity and type of dustproofing material. With some very porous coals, for example, good treatment with an economical quantity of petroleum-base material requires going to a very-high viscosity to prevent absorption of the material into the interior of the coal. Most of the high-volatile coals, however, may be treated satisfactorily with oils having a viscosity of around 200 deg.

Application—For maximum effectiveness with a minimum quantity of material, dustproofing material should be applied while the coal is in the air. Use of properly designed hoods prevents waste and insures maximum treating efficiency. Normally, such hoods are placed at the ends of loading booms or chutes, but they may also be placed over conveyors and other equipment, particularly those handling the larger sizes. The proper design of nozzle and the proper temperature at the point of application are key factors in the use of hot oil, and nozzle design is likewise important with other types of material to insure good treatment with minimum material quantities.

Regulation of material flow to the flow of coal may be accomplished by such steps as paddle-controlled valves at the ends of booms and chutes. The position of the valve is controlled by the thickness of the coal stream and in turn increases or decreases the flow of dustproofing material, preventing both overtreatment and undertreatment.

17. Freezeproofing



PURPOSE: Elimination of the labor trouble and adverse consumer reaction involved in the freezing of moist or wet coal in severe weather.

Where heat drying is not the practice and mechanical drying does not provide sufficient moisture reduction to prevent freezing, the coal may be treated with chemicals or oil to prevent freezing. Such treatment usually is required with slack, screenings and other small sizes. The need for treatment is affected not only by the climate encountered but by industry custom and customer preference. Since anthracite, for example, has been shipped wet for many years and consumers have become accustomed to this situation and many are prepared with the necessary thawing equipment, there has so far been little stress on freezeproofing in that industry.

Salt and calcium chloride, usually applied dry, are the two main chemicals used for freezeproofing. The quantity depends upon the expected temperature and the moistness of the coal. For calcium chloride, the Calcium Chloride Institute offers the following guide:

Temp. Deg. F	Pounds Calcium Chloride per Ton		
	3% Moisture	6% Moisture	9% Moisture
+32 to +15	3.0 to 4.5	6.0 to 9.0	9.0 to 13.5
+15 to 0	4.5 to 6.0	9.0 to 12.0	13.5 to 18.0
0 to −15	6.0 to 7.5	12.0 to 15.0	18.0 to 22.5

Chemicals may be thrown into the car by hand or may be dispensed by mechanical feeders into the coal stream as it is loaded. The latter normally provides more uniform and more accurate treatment.

Oil treatment, using the normal spray oil, will retard or prevent freezing if there is no great excess of water. Used crankcase oil or a similar type also has been sprayed on the interior of cars to prevent coal from freezing to the metal and thus making it easier to unload since, in some instances, the freezing is limited to a crust a few inches thick and the car can be unloaded cleanly if sticking on the sides and bottom can be prevented.

18. Loading

Anthracite is loaded into railroad cars almost entirely from storage pockets, reducing the number of loading tracks to one or two for many plants. Early bituminous practice was to provide a track for at least each major size, though a growing number of bituminous plants are providing pockets for certain sizes—usually stoker or other sizes in the smaller range. Loading of two cars on the same track also is practiced to some extent at certain bituminous plants by conveying one size to a pocket above or below the regular loading point.

Where only one size is produced, or where storage bins are provided for one or more additional sizes, loading of entire shift's run of railroad equipment can be done with the new elevated shuttle belt without moving a single car once they are set in by the railroad. One late shuttle-belt installation (*Coal Age*, March, 1953, pp 94-95) is based on elevated narrow-gage track 760 ft long with a 380-ft-long 30-in reversible belt conveyor on wheels operating on it. The belt is between two tracks accommodating 20 cars each, and coal can be loaded either way at either end of the belt by pairs of discharge chutes and diverting gates. One man at a push-button station controls belt operation and the operation of the elevating conveyor feeding coal onto it from the preparation plant.

Booms have long been used to lower the coal into railroad cars with a minimum of breakage at bituminous plants, and there is a tendency to extend their use to the smaller sizes, particularly stoker, though the chute still is the popular loading device for slack, screenings and other smaller sizes. Belt, apron and scraper-type booms are employed, with shaker booms as an added starter. The first two lend themselves to hand picking on horizontal sections. The third can be equipped with degradation screens, the breakage being returned to the mixing conveyor or other point by the bottom strand.

Mechanical retarders provide positive control of car movement in loading, and there is a growing trend toward the use of motorized equipment, including special hoists which permit pulling a car back uphill if desired, or moving it back and forth several times to load the coal in layers. The latter, among other things, reduces size segregation and improves appearance. Provisions for changing cars without stopping equipment include pantograph diversion chutes on booms which automatically come into position as the boom is raised. Other types of diversion chutes provide the same benefits with booms and also with chutes.

TRUCK LOADING

Loading of trucks requires somewhat different practices. It is possible to load trucks over the tracks or by chutes brought out from the plant but this, among other things, makes it impossible to service trucks except when the plant is running. Consequently, the usual practice is to provide bins or pockets for sizes sold to truckers. Spiral lowering chutes prevent breakage in filling bins holding the coarse sizes, and degradation in handling through the bins is removed by fixed screens in chutes, or small shakers or vibrators.

Late truck-loading plants include, in the bituminous field, a multiple-silo installation in which the coal is distributed to the pockets by a pivoted elevated belt, which is swung on a curved track from one pocket to the other for filling purposes. Trucks are loaded through chutes.

In the anthracite field, a new six-bunker plant is designed so that all operations are conducted by two men and accurate dispensing of orders is controlled by presetting dials to control flight feeders delivering at rates up to 5 tpm (*Coal Age*, January, 1954, pp 68-69). The dials are calibrated to tenths of a ton and trimming to adjust weight is seldom necessary. Coal is delivered to the truck plant by two 24-in belts housed in corrugated pipe, and is distributed to the bunkers by two shuttle conveyors.

Tramp-Iron Removal—Removal of tramp iron is handled at a number of plants, even though all sizes are washed, by suspended magnets or magnetic pulleys at the point the raw coal enters the plant. If washing or removal in the raw-coal stage is not practiced, iron removal should be done in the loading stage, especially with coal designed for stoker use. Facilities include magnets designed for use in the bottoms of loading chutes, as well as other types of units.

Degradation Removal—See Sec. 11, "Clean Coal Sizing."

19. Water Handling

Questions involved in water handling at plants cleaning by wet methods include:

1. Fresh water supply and treatment.
2. Clarification and recirculation.
3. Final disposal where closed circuits are not maintained.

Even with the best of closed circuits and good mechanical dewatering, water is lost on both the coal and the refuse. Makeup therefore is necessary, though the quantity can be reduced by closing the circuit.

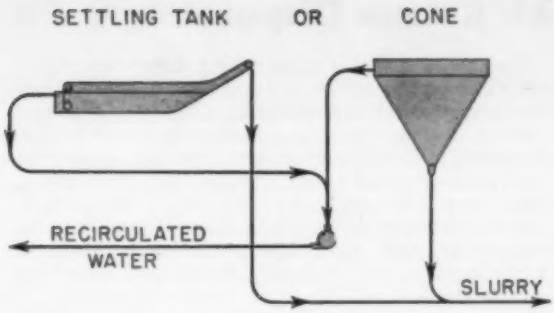
Sources of makeup water are:

1. Deep wells.
2. Surface water from lakes, ponds and streams, or from reservoirs made by dams to catch surface runoff.
3. Mine water, if available.

Water from deep wells normally can be used without treatment. Mine water, on the other hand, may be quite acid, though there are exceptions. Surface water may or may not be acid, and may at times be contaminated by mud. Some authorities hold that the pH value of the water in the plant circuit should be between 8.0 and 8.5.

Other operators, however, feel that slight acidity is not objectionable. However, if the water is very acid, treatment with lime or soda ash is in order. Treatment permits plain steel, for example, to be used instead of alloys, resulting in substantial savings in cost of equipment and materials, in replacement labor and in shutdown time. Even if the makeup is only mildly acid or neutral, acid may build up in the recirculated water and need treatment for that reason alone. Automatic equipment is now available for water treatment efficiently and at minimum cost.

Unless there is an assured minimum flow adequate for plant need at all times, storage should be provided to tide the plant over periods of reduced flow. Impounding dams, if possible, artificial ponds and storage tanks are among the answers. In hilly country where dams are not feasible, wood-stave or other tanks are employed by some operators to store up to, say, ½ million gallons. With any type of system, a small surge tank should be provided at or in the plant to receive the fresh water, which usually is added—at least in part—through clear-water sprays on the clean-coal classifying screens.



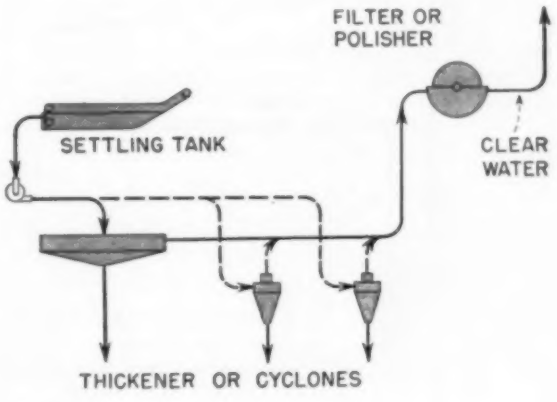
HANDLING WASH WATER

Practice in the operation of wet plants is more and more toward closed or nearly closed circuits. Objectives include (1) reducing the solids load in recirculated water, (2) recovery of medium, (3) recovery of coal, (4) elimination of discharge to streams, and (5) reduction of makeup needs. Even where the circuit is not closed, pollution regulations are more and more requiring treatment of waste water before it is dumped into streams. In addition, treatment usually also is involved to prevent solids buildup in water returned to the washing equipment, especially where clay and mud are present, since the change in the apparent gravity of the water can materially affect washing results.

One of the simplest—although not necessarily cheap—methods of handling wash water is to run it to a pond. Properly designed, such ponds can provide sufficient settling and clarification to meet pollution standards in addition to providing relatively solids-free water for recirculation. However, unless the silt is recovered by some other method, it is lost from the circuit.

Settling tanks and cones have been widely used to reduce the solids content of the wash water for recirculation or disposal and also to permit recovery of at least some of the solids. Thickeners operating on the same general principle are growing in use for the same purposes. The extent of clarification provided by such equipment depends upon the size of the material, the time provided for settlement, and the degree to which disturbance can be reduced.

Types of thickeners depending upon natural settlement include the circular units, some provided with rising currents of water; rake units; and spirals. Flocculation of the material (see Sec. 12) promotes settlement, and some types of thickeners are built to permit flocculation along with settlement.



Where desliming of a coal slurry—in other words, removal of the bulk of the material under, say, minus 200 M—is the goal, both hydraulic and nonhydraulic classifiers may be used.

Cyclone thickeners are a new and growing entry in the field of solids removal and water clarification. High capacity in a minimum of space are among the features of this unit, which can deliver thickened products running 45 to 65% solids. Solids in the clarified overflow depend mainly on the percentage of minus 200M material in the feed.

Filters of the continuous-vacuum or mechanical type are another class of equipment finding growing use in water clarification and solids recovery in coal preparation (see Sec. 12).

Completely closed circuits providing approximately clear water and almost complete recovery of solids can be achieved with a combination of various types of equipment now available. A possibility for the future, among other developments, is a final clarification unit using air bubbled through the water much like the froth-flotation machine. Setups for closed or nearly closed operation include the following combinations:

1. Settling tank followed by feed pump moving the overflow to cyclone thickeners, with thickener underflow going to vacuum-filter equipment.

2. Sludge tanks followed by centrifugal filters, with pond for periodic dumping of tanks.

3. Sludge-tank overflow to thickener to vacuum filters.

4. Classifier-type settling tank with top section taken off and routed to cyclones, with clear water from cyclone to supply pond.

5. Settling-cone overflow to "polisher-type" centrifugal filters.

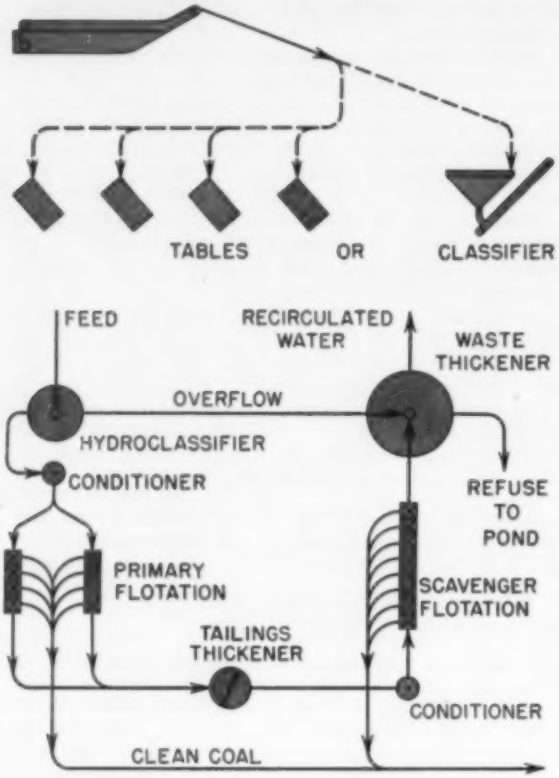
Other combinations are, of course, possible.

Medium Recovery—All heavy-media plants using magnetite include equipment for its recovery and return, with or without densification, to the cleaner circuit. Sometimes, only one magnetic separator is employed, and sometimes two are employed in series, the second acting as a polisher. On occasions, also, the magnetic separators may be preceded by thickeners. Densifiers normally are used for further thickening of the magnetite before return to the sump for recirculation. Tailings from the separators may be wasted, combined with the cleaned coal, or subjected to further cleaning before return to the plant output.

Water Circulation—Head tanks with automatically controlled pumps provide a uniform head on washing equipment, with consequent increase in the efficiency of separation, particularly with jigs. Provisions for coping with water and solids include the proper types of metals or the proper linings in pumps, as well as plastic, rubber and other special forms of pipe for certain applications to resist both wear and corrosion. Rubber-pinch and orifice-type valves solve some of the flow-control problems and provide good regulation, in addition to reducing the valve maintenance problem.

Handling of casual and spillage water is simplified by proper design of the basement floor, which should be equipped with drains leading either to the pond or to a recirculating-water sump. Cleaning up by washing down is facilitated by such construction, and, as indicated, the coal may be returned for re-processing.

20. Sludge Recovery



PURPOSES:

1. **Water clarification.**
2. **Recovery of saleable material.**

Normally, water clarification and the recovery of fine coal, whether called sludge, slurry or some other name, go hand in hand, although if clarification only is the goal, the material may only be routed to the refuse bank, particularly if it is refuse in fact. However, the percentage of material finer than, say, 10 or 28M, may be substantial at many plants and may warrant recovery for its own sake, especially if it can be shipped without further processing. Even where processing is required, the quantity and character of the fines may warrant a substantial investment, particularly if clarification also is required or is desirable.

The equipment for recovering sludge from wash water, as noted in the preceding section, includes: settling cones and tanks, and thickeners and filters, along with hydraulic and nonhydraulic classifiers. Cleaning equipment (Sec. 7) includes flotation units and special fine-coal washers, followed by normal dewatering and drying (Sec. 12).

The preceding envisions recovery of the sludge as it is produced in the plant. Another form is recovery from old silt or sludge ponds or banks, an increasing practice in recent years. Recovery equipment includes conventional shovels and also floating dredges. At some installations, the final step consists of drying. A modification, where the nature of the material warrants, is centrifuging to throw out the fine impurities and then heat drying. Where cleaning is considered desirable, a number of large plants have been built for conducting this operation by froth flotation, which may be followed by heat drying.

21. Refuse Disposal

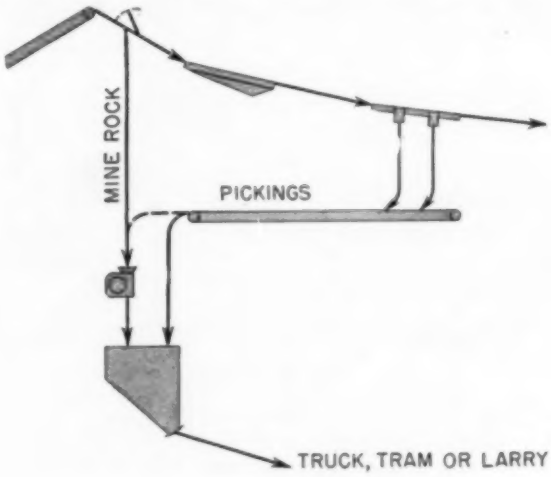
The dump truck has taken over a large part of the refuse-disposal job in the coal industry today. Its advocates cite low cost and maximum flexibility, especially where it does not have to surmount too-heavy grades. The aerial tramway lends itself not only to disposal in what might be called normal territory but also to taking refuse across hills into neighboring valleys and the like. The side-dumping or revolving larry, in addition to ordinary situations, also is used to build out from hilltops or hillsides from bins fed by belt conveyors, tramways and the like.

Some pumping of refuse is done, though the question of taking care of the water to prevent stream pollution comes in. In some instances, it has been possible to pump into old mines or worked-out sections. The pumps will handle rather large pieces but normally pumping requires crushing to a top size of 2 or 3 in. Even with other methods of disposal, especially where large mine rock is handled, it may be economical to crush with rock-type equipment, such as jaw or gyratory crushers. Easier handling, a more-compact pile and greater ease in maintaining a running surface where trucks are used are among the arguments in favor of crushing not only mine rock but also large refuse of any nature.

Where refuse output is large, and especially where trucks and similar equipment are employed, a bulldozer for spreading and compacting may pay off. Properly equipped, the bulldozer also may be used to shift track where larries are employed. A few refuse trucks themselves have been fitted with front blades or with special tailgates for spreading, particularly if the material handled tends toward the small side.

To save handling mine rock through the regular preparation refuse-disposal facilities, special rocker dumps may be installed, if conditions otherwise permit, to permit dumping directly from the mine cars themselves onto and over the bank.

Prevention of firing of refuse dumps has been the subject of considerable research in recent years, and the spread of automotive haulage has made possible new and effective methods of piling, compacting and sealing refuse to practically eliminate firing. One method of layering, compacting and sealing against air is described in *Coal Age*, June, 1951, p 91. Development of the method also was accompanied by steps to extinguish an old fire by stepping, trenching and filling and covering with earth as conditions dictated.



22. Power

Voltage—Accepted voltage for most of the stationary motors in preparation plants is 440, leaving in most instances only the question of whether 2,300 v should be used for certain large units, as on pumps, crushers and the like. A rough rule is that motors of 100 hp and larger should be 2,300.

Transformer Location—Packaged substations with oil-filled transformers are available for outdoor service, with non-flammable units for indoor. Outside is the place for the transformer station if the highline voltage is over 10,000 and the reduction to 440 is made in one step. If the supply voltage is less than 10,000, the packaged indoor substation with non-flammable transformers is the general choice, principally because it can be placed closer to the center of the load.

Controls—Starters grouped in factory-assembled control cabinets are now standard for preparation plants. One central cabinet is satisfactory for a small plant, but a large plant may require cabinets at several locations to keep the motors reasonably close to the starters. Draw-type starters which can be pulled out for quick replacement are coming more and more into favor.

Dust is one of the major problems in location and operation of starting equipment. The best solution seems to be one or as few control rooms as possible made fairly airtight and fitted with blowers to maintain a slight possitive pressure inside the rooms. Air forced into the rooms should be filtered.

Capacitors—The induction-motor load of the preparation plant produces a low power factor, which adds to the bill and heats conductors and motors. Capacitors should be installed in the plant to bring the lagging power factor up to unity. Theoretically, an appropriate capacitor should be placed at each motor. However, practical limitations of cost, space and maintenance generally make it advisable to group the capacitors in the control room.

23. Maintenance

PURPOSE: Efficient plant operation with no or a minimum of interruptions. A collateral goal is conduct of maintenance with a minimum cost for labor and materials.

Maintenance is necessary because of wear and corrosion inevitable in operation, and the effects of the elements, for example:

1. Rusting of the exterior and interior, including structural members and equipment, as a result of rain, snow and water.

2. Corrosion from acid water and, on occasion, from the gases given off by burning refuse dumps. Acid-water corrosion, of course, shows up most in washers, screens, tanks and other facilities exposed to water.

3. The effects of heat and gases involved in heat drying.

4. Wear from the handling of coal and rock.

5. Lack of lubrication, overloading and other abuse, faulty electrical service and the like, resulting in motor and machine breakdown.

MAINTENANCE FACTORS

All wear and corrosion, cannot, of course, be eliminated. However, consideration of the causes and their effects logically indicate the remedies which, in large part, are preventive in nature. In other words, use of the proper materials and proper designs when a plant is built, or when parts or sections are added or replaced in existing plants, are major factors in maintenance cost. These materials and designs include the following:

1. Location of heavy equipment, particularly of the rotating or reciprocating type, on or as near ground level as possible, cuts structural cost and reduces the effects of weight, motion and vibration.

2. Bracing, steel weight, balancing and damping to provide stiffness, reduce or eliminate unbalanced forces, and prevent the transmission of motion and vibration to the structure.

3. Use of protected steel and special roofing and siding materials, including asbestos-cement and aluminum.

4. Protective coatings and paints for steel exposed to rain, moisture, gases and the like. Paints and coatings normally, of course, are not for surfaces exposed to moving coal or rock, water carrying solids and the like.

5. Neutralization of acid water with lime or soda ash. Automatic feeding equipment now available facilitates this job. Frequently, neutralization will make it possible to get much-longer life from ordinary steel, saving both in material cost and replacement labor.

6. Use of corrosion- and abrasion-resisting materials for screens, chutes, flumes, water lines, pumps and so on, including plastic, rubber and asbestos-cement water lines and connections, and rubber-pinch and orifice-type valves. Stainless steel for bolts, for example, can solve some annoying corrosion problems in certain preparation applications.

7. Use of linings to resist wear and, with some types, corrosion. Examples include glass, tile and brick in chutes; and rubber, plastic, sand-cement and ceramic linings for tanks and cones. Entire loading pockets have, on occasion, been built of glazed tile to combat wear and corrosion. Another form of lining is special hard metal for conveyor bottoms. Hard-surfacing of wear points or the use of special wearing strips are natural accompaniments of the broad use of lining materials.

8. Use of totally enclosed, splashproof and other special motors for dusty, wet and similar locations, plus moisture- and dustproof controls or the location of controls in rooms with blowers using filtered air and maintaining a slight positive pressure inside the rooms at all times.

9. Good lubrication with proper equipment and quality lubricants of the correct types applied at the correct intervals. Centralized automatic systems are growing in favor as a result of demonstrated benefits, and have proved their ability to handle such difficult problems as underwater bearings in settling tanks.

10. Regular inspection and cleaning of preparation equipment. Cleanliness and good housekeeping for the plant as a whole naturally supplement these, and to facilitate housekeeping a growing number of plants are being equipped with hoods and covers for certain equipment connected to exhausting and dust-collecting equipment, plus vacuum systems for cleanup.

Actual conduct of maintenance is facilitated by plant design and maintenance tools and facilities. A design which provides adequate room around the various units eases inspection and cleaning, and makes repair and replacement easier when necessary. An elevator in the larger plants, in addition to the usual cranes and blocks, facilitates moving equipment, materials and tools in and

out. Monorails over centrifugal driers, screens, crushers and so on facilitate changing jackets, segments and other removable parts.

Electrical and compressed-air outlets at strategic points facilitate the use of power tools in maintenance. And, since welding and cutting play such vital roles in preparation maintenance and in plant changes, there is a real advantage in piping gas throughout the plant and having one or perhaps two or more electric welders at strategic points. Good lighting, in addition to promoting safety, facilitates checking on equipment operation, cleaning, and necessary repair and replacement.

24. Quality Control

PURPOSES:

1. Attainment of the desired preparation standards with a minimum of deviations and a maximum of efficiency.

2. Securing data on the quality of shipments for possible use in adjusting complaints and as a final check on preparation performance.

Control of preparation results starts, as indicated in earlier sections of this Guidebook, by such steps as blending, proper picking practices, uniform feed to cleaning units, proper adjustment of cleaning equipment, and so on. Checking on the results and getting records on shipments, the subject of this section, is largely a means of making sure that all the other steps are being carried out properly.

Checking and control measures are both visual and mechanical or chemical. With lump, for example, the bulk and weight of a proper sample, and the increased difficulty of getting a representative sample, make mechanical and chemical tests difficult, and reliance must be placed largely on visual inspection. In washing, visual inspection—by operators who know their business—of the feed and draw material can reveal changes in conditions immediately and permit adjustments to be made promptly, although this type of checking is subject to the normal human frailties.

Even with mechanical and chemical methods, the change in conditions takes place before the results are available, thus re-emphasizing the importance of adjusting operating conditions to provide the desired results as nearly automatically as possible. However, even though the data are obtained after the fact, mechanical and chemical tests are necessary to provide positive evidence of whether or not the desired results are being attained and permit adjustment if not.

Sampling—Where the tonnage is at all large and a careful check on quality is essential, one or more specialists should be charged with the responsibility of collecting samples. Depending upon the control setup, he also may run sink-and-float tests and prepare samples for more-elaborate chemical tests.

Number of samples and sampling intervals depend upon control and quality data required. Egg and lump —and perhaps nut and pea—may be sampled at longer intervals and perhaps only once a shift or longer. The problem grows more critical with the smaller sizes, especially where sales are made on a specification basis. As a result, many plants sample stoker and screenings, as examples, at intervals of as small as 15 min, while every hour is fairly common.

Automatic samplers installed at transfer points, especially for the smaller sizes, reduce the labor involved in sampling and tend to increase the accuracy. Manual methods include the car sample taken at a number of spots, but the trend today is toward cutting samples out of the coal as it flows into the car. A convenient method is to mount a narrow box of the requisite length and depth on a pivoted arm, which is swung through the coal stream at the specified intervals. Labor is saved and the sample tends to be more representative.

If the sample is intended for chemical analysis in the laboratory, time and labor can be saved by placing the preliminary sample-preparation equipment — crusher, splitter and the like—at or near the point the sample or samples are taken. As an example, some plants have provided platforms alongside the loading booms for sample preparation. Among other things, this permits running the coal left over after splitting directly to the car.

Test Procedure—Samples for checking cleaner operation normally are processed by sink-and-float. The equipment, which includes factory-made units designed specifically for the job, may be on the cleaning floor or at some other convenient location in the plant. The weight of the sink in a standard sample of cleaned coal is a working indication of how the cleaner is performing. The results also may be converted into fairly accurate ash figures by reference to a curve based on the average results of analysis of a representative number of samples, provided testing is carefully done and the character of the refuse is not subject to sharp fluctuations.

Checking the efficiency of washer operation also requires testing of refuse to make sure that coal loss is not excessive, and also of the raw feed to determine whether a change in its character will establish different limits on the results that may be expected or will necessitate readjustment to attain the original standards.

More precise results of course can normally be expected by laboratory procedure, although the time interval necessarily is longer. Equally or more important, the laboratory is the only means of attaining all the chemical and physical data on both processing results and the character of the shipped coal, including ash, sulphur, moisture, heat content, fusion and softening temperatures of ash, and so on. Also, the presence of laboratory facilities permits research into suggested changes in preparation procedures and forecasting of results. Therefore, more and more plants are being supplemented by well-equipped laboratories. An example is the subject of an article in the April, 1950, issue of *Coal Age*, p 90.

Laboratories normally are placed in separate structures although a few have been built in the preparation plants themselves. The added convenience is said to more than compensate for the necessity of careful enclosure to keep out dust and noise, and the cost of methods of insulating the laboratory from vibration and motion.

Sizing Control—Since the accuracy of screening can have a major effect not only on realization but also on customer acceptance, quality control must take in size checking also. Facilities will vary with the circumstances at the individual plants but they should at least include a test-screen unit, which may be purchased from various manufacturers.

Records—The type of records kept for operating and quality-control purposes should provide for putting down the data obtained in a form that will make it easily available to and usable by operators, supervisors and other interested persons. Graphic presentation by curves may be a part of the record system, and the data to be entered may include such things as valve settings on washers. For shipments, the record may show car number, size, ash, sulphur, heat content, moisture and so on.

PREPARATION BUYING GUIDE

Black-faced type indicates companies making the products listed and advertising these or other products in this issue of *Coal Age*

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Aerial Tramways—See Refuse Disposal

Air Cleaners, Coal

American Coal Cleaning Corp., Kingsport, Tenn.

Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

Klockner-Humboldt-Deutz AG, Koln, Germany (ADV., pg 120)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Roberts & Schaefer Co., 130 N. Wells St., Chicago 6, Ill. (ADV., pg 112)

Analysis—See Coal Testing & Analysis

Bearings—See Power Transmission

Belt Drives—See Power Transmission

Belt-Maintenance Materials

Armstrong-Bray & Co., 5346 Northwest Hwy., Chicago 30, Ill. (ADV., pg. 160)

Flexible Steel Lacing Co., 4607 Lexington St., Chicago 44, Ill. (ADV., pg. 154)

W. O. & M. W. Talcott, Inc., 91 Sabin St., Providence, R. I.

Belting, Conveyor

American Rubber Mfg. Co., 1145 Park Ave., Oakland 8, Calif.

Boston Woven Hose & Rubber Co., Boston 3, Mass.

Carlyle Rubber Co., 6266 Park Pl., New York 7, N. Y.

Cincinnati Rubber Mfg. Co., Franklin Ave. (Norwood), Cincinnati 12, Ohio

Goodall Rubber Co., 430 Whitehead Rd., Trenton 4, N. J.

B. F. Goodrich Co., 500 S. Main St., Akron 18, Ohio (ADV., pg 1, 211)

Goodyear Tire & Rubber Co., 1144 E. Market St., Akron 16, Ohio

Hamilton Rubber Mfg. Co., Mead St., Trenton 3, N. J.

Hewitt-Robins, Inc., Hewitt Rubber Div., 240 Kensington Ave., Buffalo 5, N. Y. (ADV., pg 18-19)

Manhattan Rubber Div., Raybestos-Manhattan, Inc., Passaic, N. J. (ADV., pg 113)

Pioneer Rubber Mills, 345 Sacramento St., San Francisco 11, Calif.

Quaker Rubber Corp., Philadelphia 24, Pa. (ADV., pg 122)

Republic Rubber Div., Lee Tire & Rubber Co., Youngstown 1, Ohio

Scandinavia Belting Co., 248 Central Ave., Newark 1, N. J. (ADV., pg 110)

Thermoid Co., 315 Whitehead Rd., Trenton 6, N. J. (ADV., pg 199)

United States Rubber Co., 1230 Ave of the Americas, New York 20, N. Y. (ADV., Third Cover)

Bin Gates—See Gates, Bin

Bin Vibrators—See Vibrators, Bin

Bin-Level Indicators

Bin-Dicator Co., 12946 Kercheval Ave., Detroit 15, Mich.

Blaw-Knox Co., Blawnox, Pa.

Iowa Mfg. Co., 916 16th St., N. E., Cedar Rapids, Iowa

Jeffrey Mfg. Co., 916 N. 4th St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Lippman Engineering Works, 4603 W. Mitchell St., Milwaukee 14, Wis.

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Syntron Co., 408 Lexington, Homer City, Pa.

Bins, Storage and Blending

(**Indicates concrete types available*)

*Butler Bin Co., 993 Blackstone Ave., Waukesha, Wis.

W. E. Caldwell Co., 2220 Brook St., Louisville 8, Ky.

Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Continental Gin Co., 4500 Fifth Ave., S. Birmingham, Ala. (ADV., pg 129)

Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

Robt. Holmes & Bros., Inc., 520 Junction Ave., Danville 1, Ill. (ADV., pg 85)

*Iowa Mfg. Co., 916 16th St., N. E., Cedar Rapids, Iowa

C. S. Johnson Co., Champaign, Ill.

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Lippman Engineering Works, 4603 W. Mitchell St., Milwaukee, Wis.

*Neff & Fry Co., Camden, Ohio (ADV., pg 154)

*Nicholson Co., Inc., 10 Rockefeller Plaza, New York 20, N. Y.

Pioneer Engineering Works, 1515 Central Ave., Minneapolis, Minn.

Blowers, Jig

Dresser Industries, Roots-Connersville Blower Div., 16th & Ironton Sts., Connersville, Ind.

Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

Reed Standard Corp., York, Pa.

Booms, Loading—See Loading Equipment

Breakers, Rotary

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Pennsylvania Crusher Co., 1711 Liberty Trust Bldg., Philadelphia 7, Pa. (ADV., pg 148)

Builders—See Preparation-Plant Builders

Buildings, Prefabricated

Armco Drainage & Metal Products, Inc., 708 Curtis St., Middletown, Ohio (ADV., pg 248)

Bethlehem Steel Co., Bethlehem, Pa. (ADV., pg 20, 36, 44)

Blaw-Knox Co., Blawnox, Pa.

Butler Mfg. Co., 13th and Eastern Ave., Kansas City 3, Mo.

McClosky Co., 3401 Liberty Ave., Pittsburgh, Pa.

Steel Built Construction Co., 1260 Carrol St., Bridgeville, Ohio

Steelcraft Mfg. Co., 9066 Blue Ash Rd., Rossmoyne, Ohio

Truscon Steel Co., 1315 Albert St., Youngstown 1, Ohio

Calcium Chloride—See Dustproofing, Freezeproofing

Car Retarders, Pullers—See Retarders, Pullers

Car Shakers

Allis-Chalmers Mfg. Co., 888 S. 7th St., Milwaukee 1, Wis. (ADV., pg 101, 123, 164)

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HOW TO *Upgrade Your Coal* TO MEET CUSTOMERS' SPECIFICATIONS

Upgrading is washing and McNally Pittsburg can do it in a number of ways



TRUAX-TRAER COAL COMPANY, CREDO, W. VA.
Using McNally Norton Baum Jig Type Washer



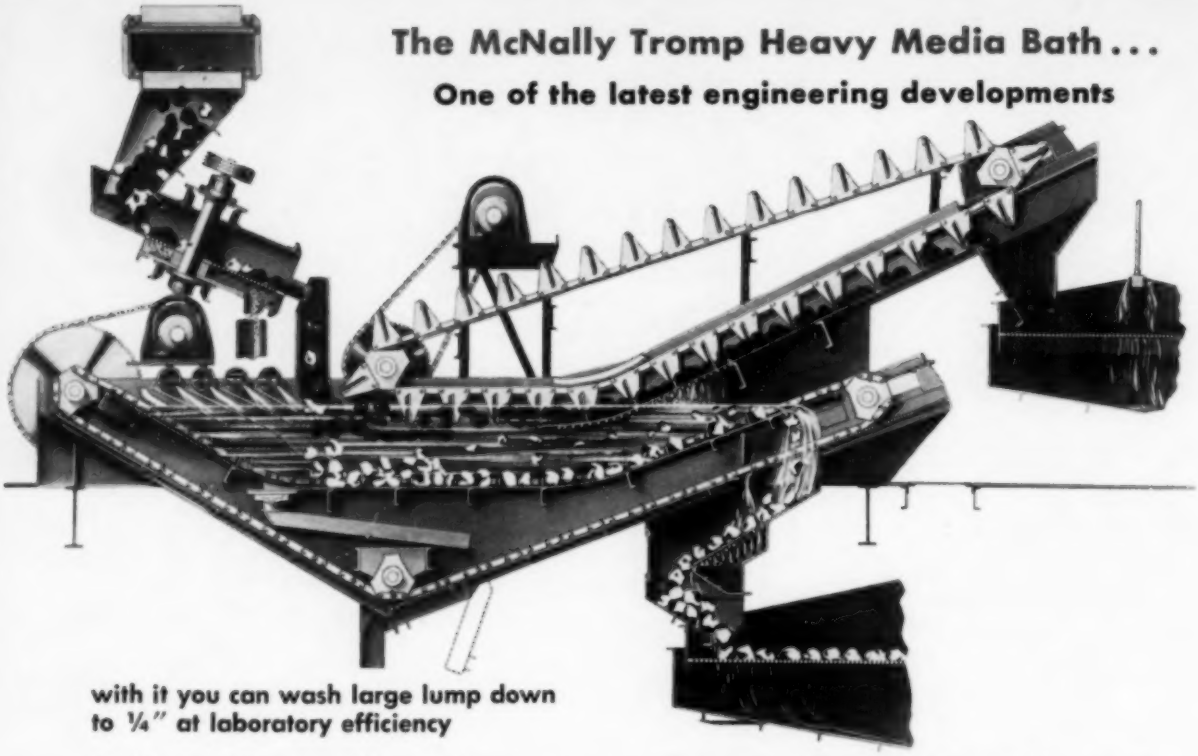
OLD BEN COAL CORP., MINE 22, FRANKLIN COUNTY, ILL.
Using McNally Tromp Heavy Media Bath

OPEN TO INSIDE PAGE

McNALLY PITTSBURG

"The Men Who Know Coal From The Ground Up"

McNally Pittsburg Offers Coal Preparation



The McNally Tromp Heavy Media Bath . . .

One of the latest engineering developments

with it you can wash large lump down to ¼″ at laboratory efficiency

The Tromp Bath employs the patented laminar flow principle. Coal enters the bath at a controlled rate of discharge from the raw coal conveyor. It moves continuously and slowly through the bath and by flotation the coal rises. Coal, clean coal conveyor, middle gravity particles, dense media solution, and sink conveyor move at the same speed through the bath from raw coal inlet towards the discharge end with no turbulent or disturbing upward currents.

Clean coal is discharged to rinsing screens while middlings, transported by laminar flow solution, are intercepted by refuse conveyor near refuse discharge point. They are then discharged, along with refuse, to the refuse rinsing screens.

A high accumulation of middle gravity particles will not hamper the efficiency of the McNally Tromp Dense Media Bath since these particles are continuously removed from the bath proper.

The Tromp Bath utilizes coarse ground magnetite, mill scale, limestone, or other heavy media specific gravity particles which may or may not be recovered by magnetic principle.

These Coal Preparation Plants Are Typical of Those Using the Tromp Heavy Media Bath



Eastern Coal Corporation
Stone, Ky.



Republic Steel Corporation, Sayre Mine
Birmingham, Ala.



Old Ben Coal Corporation
Franklin County, Ill.



Seminole Coal Corporation
Lenzberg, Ill.

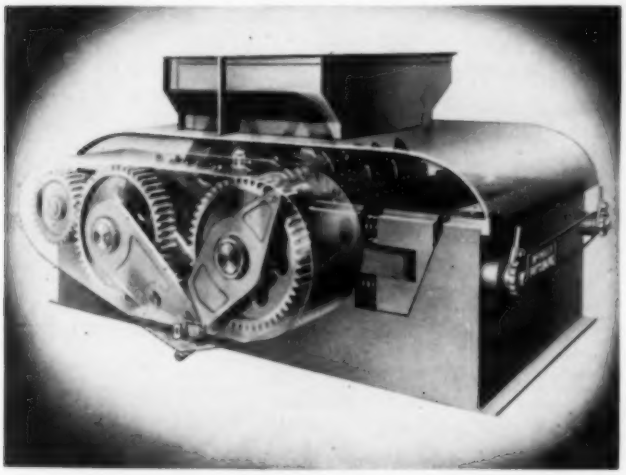
McNally Pittsburg Manufacturing Corporation—Manufacturing Plants: Pittsburg, Kansas • Wellston, Ohio
Engineering & Sales Offices: Pittsburgh • Chicago • Rio de Janeiro • Pittsburg, Kansas • Wellston, Ohio

ngineering • Streamlined Plant Design



McNALLY CARPENTER CENTRIFUGAL DRYER

Flexible centrifugal unit that makes continuous drying possible for any size plant. Noted for high water removal, large capacity, small loss of product in effluent. Dries to a predetermined moisture percentage. Especially efficient in drying minus ⅜" size. Power consumption and maintenance costs very low.



STOKER COAL CRUSHER

Heavy Duty and Standard Duty

The McNally Pittsburg Gearmatic Stoker Coal Crusher offers three prime advantages in stoker coal crushing . . . High volume production . . . Accurate sizing . . . Low percentage of fines.

The cone-shaped teeth are staggered to give an interlocking mesh. As the segment rolls revolve, the teeth pierce and split the coal. The result is a minimum production of fines.

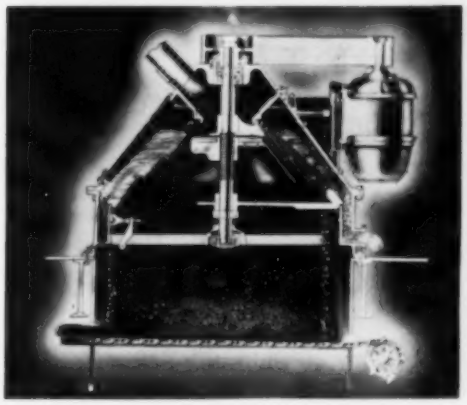
McNALLY PITTSBURG

MANUFACTURERS OF EQUIPMENT TO MAKE COAL A BETTER FUEL

McNALLY DRYCLONE

The latest engineering development in low cost Centrifugal Dryers

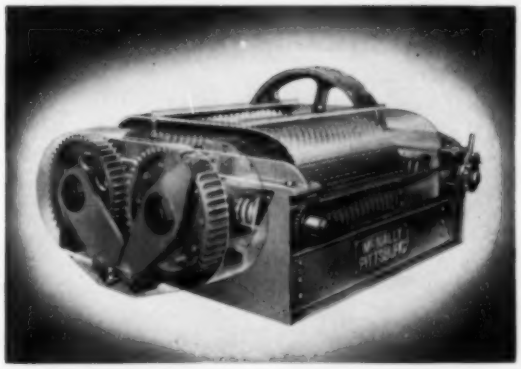
High efficiency, low cost centrifugal dryer. There are no gears to become noisy, wear out, or require frequent replacement. There are no belts or flexible couplings. Yields a product with delivered surface moisture as low as 5% and at an operating cost of less than 5c per ton. The low cost efficient dryer for all size coal washing plants.



McNALLY GEARMATIC DOUBLE ROLL BREAKER

By eliminating excessive large lump from run-of-mine, you automatically reduce maintenance on your preparation equipment. Lump no bills become a thing of the past. These breakers handle tonnages ranging from 750 to 1400 TPH, and three sizes are available.

A built-in feature of the Gearmatic Breaker is its ability to reduce lumps without producing excessive fines. The specially designed crushing segment teeth hit the lump coal with a splitting action. The result is that the lumps break apart freely without grinding off an excessive amount of small particles.



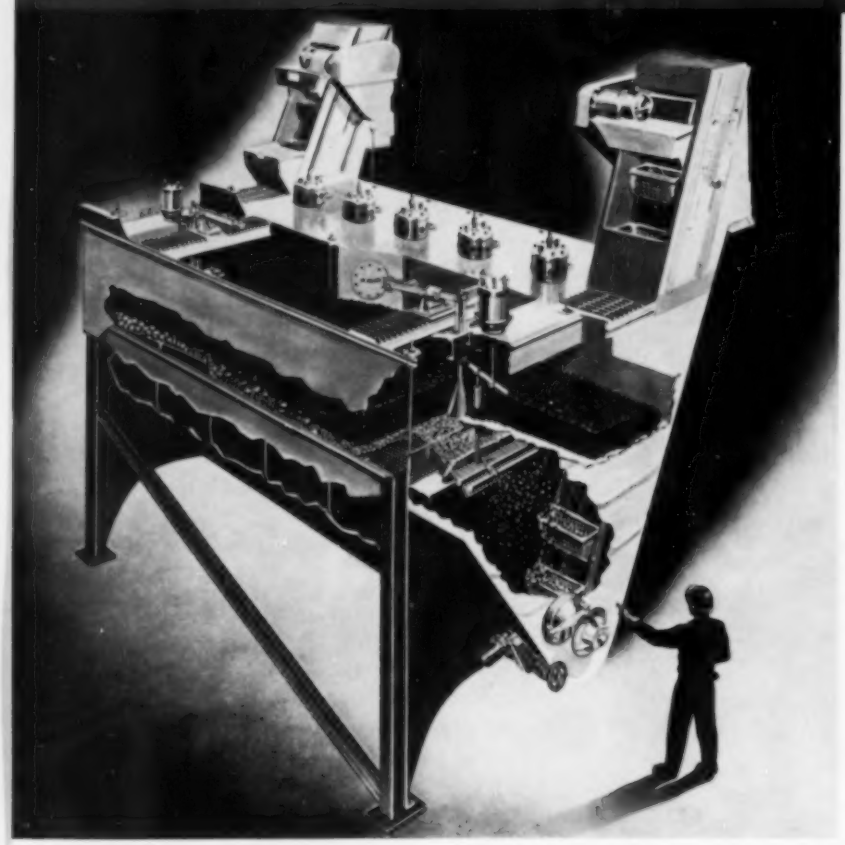
"The Men Who Know Coal From The Ground Up"

The Original

McNally Norton Coal Washer

has kept hundreds of operators in the black . . .

Over 200 Nortons in Operation



McNALLY NORTON WASHER

for clean-cut separation of coal from refuse

The McNally Norton Washer is a fully automatic unit which stays in balance at a predetermined specific gravity separation point despite variations in tonnage or characteristics of the incoming feed. It is a Baum jig type washer, using air to distend the bed intermittently to effect stratification of both coal and refuse on the basis of specific gravity.

SIMPLE OPERATION

Operation of the washer is simple and positive. Raw coal is cleaned in two stages. A primary separation at the feed end of the washer removes the heavier refuse material. The secondary compartment divides the coal into a bottom layer of middlings, on which rides a second layer of quality coal. At the discharge end, the two layers are split, the good coal passing into a delivery sluice. Middling material is discharged separately for rejection or reprocessing; or it may be delivered as a second grade coal.

Coal Operators around the world have placed their confidence in McNally Pittsburg Washers

With a McNally Norton System you can improve your coal with minimum investment and operating costs. It permits operation of high ash seams. It makes mechanical loading practical. You also get more dollar income per ton because you reclaim good coal that formerly went to the refuse bank.

These washers can be installed in remodeled tipples as well as in new plants. They can be built into tandem or parallel circuits to handle any tonnage of feed. They can also be used in conjunction with other types of washing equipment where reprocessing or additional recovery is desired.

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PITTSBURG, KANSAS

OPEN TO INSIDE PAGE

HOW TO *Upgrade Your Coal* TO MEET CUSTOMERS' SPECIFICATIONS

Upgrading is washing and McNally Pittsburg can do it in a number of ways



TRUAX-TRAER COAL COMPANY, CREDO, W. VA.
Using McNally Norton Baum Jig Type Washer



OLD BEN COAL CORP., MINE 22, FRANKLIN COUNTY, ILL.
Using McNally Tromp Heavy Media Bath

OPEN TO INSIDE PAGE

McNALLY PITTSBURG

"The Men Who Know Coal From The Ground Up"



RAIL-TO-RIVER LOADING EQUIPMENT

Coal operators know that rail-to-river loading equipment, where coal is transported mechanically from railroad cars to river barges or lake steamers, provides a means of reaching distant markets at *favorable freight* rates, considerably under all rail routes. These installations are frequently a joint operation where several coal producers join together to build the equipment at a central location to handle the product of several mines, or in some instances, the coals from preparation plants for distribution at various points along the waterway.

The pictures of plants, illustrated here, are typical of those for which we have been awarded contracts for fabricating and erecting the structures. We shall be glad to consult with executives and plant engineers on projects of this kind.



Rail-to-river Loading Equipment at Ceredo, West Virginia, illustrated above. Coal is transferred directly from railroad cars or from the preparation plant. Metallurgical coal is loaded on barges for distribution to the steel mills in the Wheeling and Pittsburgh areas.

Rail-to-river Loading Equipment at Kenova, West Virginia, illustrated at left, furnishes a central plant for the transfer of coal from several mines in the area, for distribution by river barges at various points.

FACILITIES NOW UNDER CONSTRUCTION

Not illustrated with these outstanding coal transferring facilities are the new 800 TPH crushing and dock-loading facilities for Yankeetown Dock Corporation, Yankeetown, Indiana.

McNally Field Service Engineers



Jack Craig
P. O. Box 228
Wellston, Ohio
Phone 167



Wesley Smith
P. O. Box 335
Pinckneyville, Ill.
Phone 6266



Jerry Lentz
108 Kent Ave.
Terre Haute, Ind.
Phone
Lincoln 2779



James Carter
P. O. Box 102
Beckley, W. Va.
Phone 3186

These service men have been placed at strategic locations so that they can reach you quickly in an emergency. In their regular course of duty they will be calling upon you to check your equipment and to answer any questions regarding operating efficiency or maintenance. Please use this service, which is free.

"The Men Who Know Coal From The Ground Up"

McNALLY ▲ PITTSBURG

McNally Pittsburg Manufacturing Corporation—Manufacturing Plants: Pittsburg, Kansas • Wellston, Ohio
Engineering & Sales Offices: Pittsburgh • Chicago • Rio de Janeiro • Pittsburg, Kansas • Wellston, Ohio



INTERIOR of the Hydrotator tank at Carpentertown Coal and Coke Company's No. 1 mine, showing the Stainless Steel lining and Stainless rotating parts. The Hydrotator is manufactured by Wilmot Engineering Company, Hazelton, Pa.

saves periodic maintenance bill of $515... eliminates loss of thousands of tons of coal

● Over the last six years, Carpentertown Coal and Coke Company has been shifting to the use of Stainless Steel throughout the entire cleaning plant at its No. 1 mine near Mt. Pleasant, Pa.

One of the most significant savings from this shift involves the Hydrotator cone which has been lined with ⅜" Stainless Steel. Formerly, it was not tank necessary to replace the lining frequently, but about every 18 months the entire tank had to be replaced. This involved $200 in labor and $315 in materials, to say nothing of the loss of 100 tons of coal per hour during the three or four days necessary to make repairs.

The Stainless lining has been in service nearly a year and shows no sign of erosion. The tank itself should last indefinitely. Harry Mathias, mine superintendent, says, "We are seriously considering making the entire tank of Stainless Steel in the future . . . then we wouldn't have anything to worry about."

In addition to the lining, all rotating members of the unit are Stainless Steel. "The agitator pipe," says Mr. Mathias, "is made completely of Stainless and should last at least a year, compared to 60 days' service we were getting from common steel."

You'll find many spots in your plant where Stainless Steel can give longer equipment life, reducing maintenance and replacement bills and eliminating downtime with its accompanying loss of production. When you use it, be sure it is perfected, service-tested USS Stainless Steel.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

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SHEETS · STRIP · PLATES
BARS · BILLETS
USS
PIPE TUBES · WIRE
SPECIAL SECTIONS

4-696

UNITED STATES STEEL

Preparation Buying Guide . . .

Car Shakers (Cont'd)

American Engineering Co., 2413 Aramingo, Philadelphia, Pa.

Heyl & Patterson, Inc., 55 Ft. Pitt Blvd., Pittsburgh 22, Pa. (ADV., pg 86-87)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Robins Conveyors, Div., Hewitt-Robins, Inc., 270 Passaic Ave., Passaic, N. J. (ADV., pg 18-19)

Centrifuges—See Driers

Centrifugal Thickeners—See Cyclones

Chain, Conveyor and Elevator

American Chain & Cable Co., 929 Connecticut Ave., Bridgeport 2, Conn. (ADV., pg 33)

American Manganese Steel Div., American Brake Shoe Co., 434 E. 14th St., Chicago Heights, Ill.

Chain Belt Co., 4786 W. Greenfield, Milwaukee 1, Wis. (ADV., pg 247)

Continental Gin Co., Birmingham, Ala. (ADV., pg 129)

Robt. Holmes & Bros., Inc., 520 Junction Ave., Danville 1, Ill. (ADV., pg 85)

Jeffrey Mfg. Co., 962 N. 4th St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Kensington Steel Co., 501 E. Kensington Ave., Chicago 28, Ill.

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Long Co., Oak Hill, W. Va. (ADV., pg 220)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Pettibone Mulliken Co., 4710 W. Division St., Chicago 51, Ill.

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Webster Mfg. Co., Tiffin, Ohio

Whitney Chain Co., 237 Hamilton St., Hartford 2, Conn.

Wilmot Engineering Co., Markle Bank Building, Hazleton, Pa. (ADV. pg. 91)

Chain Drives—See Power Transmission

Change Facilities — See Wash & Change Facilities

Chutes

(**Indicates spiral lowering also available*)

Barber-Greene Co., 400 N. Highland Ave., Aurora, Ill. (ADV., pg 126)

Continental Gin Co., Birmingham, Ala. (ADV., pg 129)

Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

*Haslett Chute & Conveyor Co., Oaks, Pa.

Hendrick Mfg. Co., Carbondale, Pa. (ADV., pg 155)

***Robt. Holmes & Bros., Inc.**, 520 Junction Ave., Danville 1, Ill. (ADV., pg 85)

Iowa Mfg. Co., 916 16th St., Cedar Rapids, Iowa

C. S. Johnson Co., Box 71, Champaign, Ill.

Kanawha Mfg. Co., Box 1786, Charleston, W. Va. (ADV., pg 95)

Lippman Engineering Works, 4603 W. Mitchell St., Milwaukee 14, Wis.

***McNally Pittsburg Mfg. Corp.**, Pittsburg, Kan. (ADV., insert fol. pg 76)

Remaly Mfg. Co., Tamaqua, Pa. (ADV., pg 160)

Robins Conveyors Div., Hewitt-Robins, Inc., 270 Passaic Ave., Passaic, N. J. (ADV., pg 18-19)

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Webster Mfg. Co., Tiffin, Ohio

Chutes, Diversion — See Loading Equipment

Cleaners—See Air Cleaners, Coal; also Froth Flotation, Washers

Cloth—See Screen Cloth

Classifiers

HYDRAULIC

Colorado Iron Works Co., 1624 17th St., Denver 2, Colo. (ADV., pg 98)

Deister Concentrator Co., 929 Glasgow Ave., Ft. Wayne 1, Ind.

Deister Machine Co., 1933 E. Wayne St., Ft. Wayne 4, Ind. (ADV., pg 160)

Denver Equipment Co., 1414 17th St., Denver 17, Colo.

Dorr Co., Barry Place, Stamford, Conn. (ADV., pg 128)

Hardinge Co., Inc., York, Pa.

Humphreys Investment Co., Denver 2, Colo.

Morse Bros. Machinery Co., 2900 Brighton Blvd., Denver 2, Colo.

Western Machinery Co., 760 Folsom St., San Francisco 7, Calif. (ADV., pg 79)

Wilmot Engineering Co., Markle Bank Bldg., Hazleton, Pa. (ADV., pg 91)

MECHANICAL

Colorado Iron Works Co., 1629 17th St., Denver 2, Colo. (ADV., pg 98)

Denver Equipment Co., 1414 17th St., Denver 17, Colo.

Dorr Co., Barry Place, Stamford, Conn. (ADV., pg 128)

Eimco Corp., 634 S. 4th St., W., Salt Lake City 10, Utah (ADV., pg 145)

Morse Bros. Machinery Co., 2900 Brighton Blvd., Denver, Colo.

Southwestern Engineering Co., 4800 Santa Fe Ave., Los Angeles 11, Calif.

Western Machinery Co., 760 Folsom St., San Francisco 7, Calif. (ADV., pg 79)

Coal Testing and Analysis

Commercial Testing & Engineering Co., 307 N. Michigan Ave., Chicago 1, Ill.

Morgantown Coal Testing Laboratory, 401 University Ave., Morgantown, W. Va.

Pittsburgh Testing Laboratory, 1330 Locust St., Pittsburgh 19, Pa.

Southern Testing Laboratory, Inc., 2227 First Ave., S., Birmingham, Ala.

Warner Laboratories, Cresson, Pa. (ADV., pg 106)

Western Machinery Co., 760 Folsom St., San Francisco 7, Calif. (ADV., pg 79)

Coal Washers—See Washers

Conditioners—See Froth Flotation

Consultants, Preparation

(**Indicates professional card, pg 225 of this issue*)

*Alford, Morrow & Associates, 1632 Oliver Bldg., Pittsburgh 22, Pa.

***Allen & Garcia Co.**, 332 S. Michigan Ave., Chicago 4, Ill. (ADV., pg 93)

American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y. (ADV., insert fol. pg 92)

*Archineer Design Associates, Box 407, Fairmont, W. Va.

*George S. Baton & Co., 1100 Union Trust Bldg., Pittsburgh 19, Pa.

Daniels Co. Contractors, Inc., 26 N. 5th St., Indiana, Pa. (ADV., pg 161)

*Eavenson, Auchmuty & Summers, 2700 Koppers Bldg., Pittsburgh 19, Pa.

*Henry O. Erb, Box 867, Terre Haute, Ind.

Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

*Ferguson-Gates Engineering Co., Box 672, Beckley, W. Va.

*J. H. Fletcher, 332 S. Michigan Ave., Chicago 4, Ill.

T. W. Guy, Kanawha Valley Bldg., Charleston, W. Va.

Knowles Associates, 19 Rector St., New York 6, N. Y.

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Pierce Management, Inc., Scranton Electric Bldg., Scranton 3, Pa.

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

*Davis Read, 225 E. Noel Ave., Madisonville, Ky.

Robinson & Robinson, Union Bldg., Charleston, W. Va.

Senior, Juengling & Knall, 2107 7th Ave., S., Birmingham, Ala.

***Templeton-Matthews Corp.**, Sycamore Bldg., Terre Haute, Ind. (ADV., pg 130)

United Engineers & Constructors, Inc., Philadelphia 5, Pa. (ADV., pg 137)

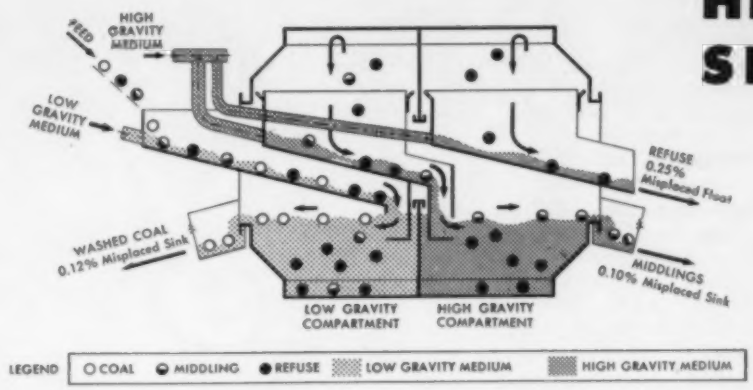
*Paul Weir Co., 20 N. Wacker Dr., Chicago 6, Ill.

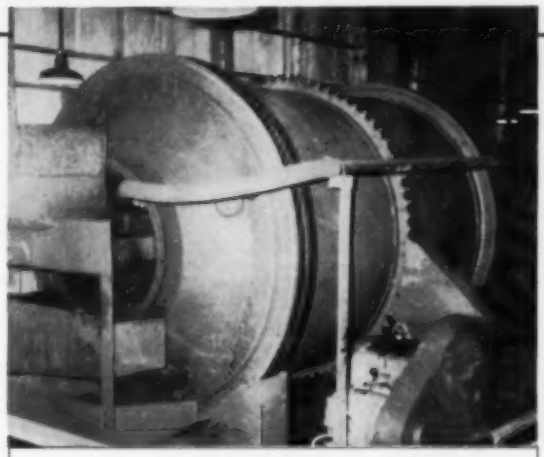
Western Knapp Engineering Co., Div. Western Machinery Co., 760 Folsom St., San Francisco 7, Calif. (ADV., pg 79)

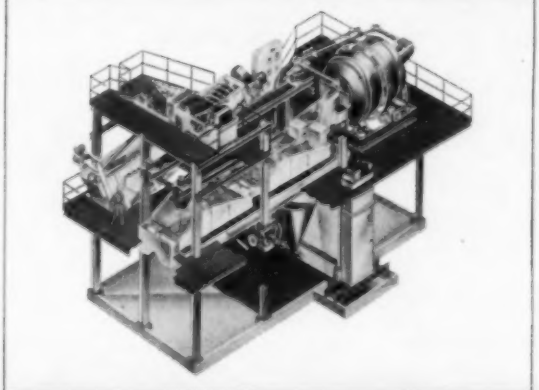
two-gravity, three-product

HEAVY-MEDIA SEPARATION

in one vessel







Here is how a Virginia operator uses the Wemco Mobil-Mill for accurate coal washing . . . with only 0.47% total misplaced material!

A prominent Virginia coal producer is now employing a Wemco Mobil-Mill for the precision cleaning of coal containing middling material. Using a No. 4C Wemco Mobil-Mill with an 8′ x 12′ Two-Compartment Drum Separator, this operator washes 114 TPH of 2½″ x ¼″ coal in the manner shown on the accompanying flow diagram.

OPERATING PRINCIPLE OF TWO-COMPARTMENT DRUM SEPARATOR

- True float coal is separated by a low gravity media in first compartment, while sink consisting of refuse and middlings passes to second compartment.
- True sink and middlings are separated by a high gravity media in second compartment.
- Both high and low gravity media remain uniform and constant in density in their respective drum compartments.
- The entire separation is accomplished within one unit.

The Wemco Mobil-Mill is a complete washing unit which provides exceptional accuracy and efficiency of separation for the consistent production of premium coal. It can be furnished in capacities up to 420 TPH and with three types of separators:

1. **WEMCO TWO-COMPARTMENT DRUM for coals having middling content requiring two-gravity, three-product separation.**
2. **WEMCO SINGLE DRUM for coals less complex.**
3. **WEMCO CONE SEPARATOR for coals in sizes up to 4″.**

PLANTS DESIGNED TO YOUR NEEDS
Through its Western-Knapp Engineering Co. Division, Wemco offers a complete design and engineering service for the construction and equipping of complete coal preparation plants, either of the Mobil-Mill or stationary types.

RENT OR PURCHASE MOBIL-MILLS
Now you can secure the advantages of Mobil-Mill operation without delay. Take advantage of Wemco's rental, rental with option to buy or outright purchase plans.

WEMCO
WESTERN MACHINERY COMPANY
760-766 FOLSOM STREET · SAN FRANCISCO 7, CALIFORNIA

Mobil-Mills • Coal Spirals • HMS Thickeners • HMS Pumps • Sand Pumps Cone Separators • Drum Separators • Fagergren Laboratory Units • Agitators Fagergren & Steffensen Flotation Machines • Hydroseparators • S-H Classifiers HMS Laboratory Units • Dewatering Spirals • Thickeners • Conditioners • Densifiers

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P. O. Box 619, Johannesburg, South Africa
Lilestone & Co., Inc.
P. O. Box 3368, Manila, Philippines
United Development Corporation Pty. Ltd.
P. O. Box 3460, Sydney, N. S. W., Australia
Corporation Commercial Sudomericana S. A.
Casilla 505, Lima, Peru
The Sumitomo Machinery Co., Ltd.
5-22 Kitahama, Higashi-Ku, Osaka, Japan

Preparation Buying Guide . . .

Consultants (Cont'd)

° J. W. Woomer & Associates, Natl. Bank Bldg., Wheeling, W. Va.

Contractors, Electrical—See Electrical Equipment, Installation Contractors

Controls, Electrical—See Electrical Equipment

Controls, Operating, Television

Diamond Power Specialty Co., Lancaster, Pa.

DuMont Laboratories, Instrument Div., Clifton, N. J.

Radio Corp. of America, Engineering Products Dept., Camden, N. J.

Controls, Sand-Flotation Cones

Moore Products Co., H & Lycoming Sts., Philadelphia, Pa.

Conveyor Weighers

Builders-Providence, Inc., 16 Codding St., Providence, R. I.

John Chatillon & Sons, 85 Cliff St., New York 7, N. Y.

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

Merrick Scale Mfg. Co., 178 Autumn St., Passaic, N. J. (ADV., pg 100)

Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y.

Richardson Scale Co., Van Houten Ave. at Campbell St., Clifton, N. J.

Schaffer Poidometer Co., 2828 Smallman St., Pittsburgh 28, Pa.

Sintering Machinery Corp., Netcong, N. J.

Streeter-Amet Co., 4107 Ravenswood Ave., Chicago 13, Ill.

Syntron Co., 691 Lexington, Homer City, Pa.

Toledo Scale Co., 1002 Telegraph Rd., Toledo 1, Ohio

Conveyors & Parts

APRON

Allis-Chalmers Mfg. Co., 888 S. 70th St., Milwaukee 1, Wis. (ADV., pg 101, 123, 164)

Bonded Scale & Machine Co., 2176 S. Third St., Columbus 7, Ohio

Chain Belt Co., 4786 W. Greenfield, Milwaukee 1, Wis. (ADV., pg 247)

Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Continental Gin Co., 4500 Fifth Ave., S., Birmingham, Ala. (ADV., pg 129)

Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Lippman Engineering Works, 4603 Mitchell St., Milwaukee 14, Wis.

McLanahan & Stone Corp., Hollidaysburg, Pa. (ADV., pg 99)

McNally-Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Traylor Engineering & Mfg. Co., Allentown, Pa.

Webster Mfg. Co., Tiffin, Ohio

BELT

Barber-Greene Co., 400 N. Highland Ave., Aurora, Ill. (ADV., pg 126)

Bonded Scale & Machine Co., 2176 S. Third St., Columbus 7, Ohio

Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Continental Gin Co., 4500 Fifth Ave., S., Birmingham, Ala. (ADV., pg 129)

Dodge Mfg. Corp., Mishawaka, Ind., (ADV., insert fol. pg 92)

Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

Iowa Mfg. Co., 916 N. 16th St., Cedar Rapids, Iowa

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Kanawha Mfg. Co., Box 1786, Charleston, W. Va. (ADV., pg 95)

Frank A. Kremser & Sons, Inc., 3435 N. Fifth St., Philadelphia 40, Pa.

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Lippman Engineering Works, 4603 W. Mitchell St., Milwaukee 14, Wis.

McLanahan & Stone Corp., Hollidaysburg, Pa. (ADV., pg 99)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn.

Robins Conveyors Div., Hewitt-Robins, Inc., 270 Passaic Ave., Passaic, N. J. (ADV., pg 18-19)

Sprout, Waldron & Co., 100 Sherman Ave., Muncy, Pa.

Stphens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Transall, Inc., 109 N. 11th St., Birmingham 4, Ala.

Webster Mfg. Co., Tiffin, Ohio

CHAIN SCRAPER & DRAG

Barber-Greene Co., 400 N. Highland Ave., Aurora, Ill. (ADV., pg 126)

Bonded Scale & Machine Co., 2176 S. Third St., Columbus 7, Ohio

Chain Belt Co., 4786 W. Greenfield Ave., Milwaukee 1, Wis. (ADV., pg 247)

Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Continental Gin Co., 4500 5th Ave., S., Birmingham, Ala. (ADV., pg 129)

Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Kanawha Mfg. Co., Box 1786, Charleston, W. Va. (ADV., pg 95)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McLanahan & Stone Corp., Hollidaysburg, Pa. (ADV., pg 99)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Webster Mfg. Co., Tiffin, Ohio

Wilmot Engineering Co., Markle Bank Bldg., Hazleton, Pa. (ADV., pg 91)

Portable—See Storage & Reclamation Equipment

OSCILLATING, SHAKING & VIBRATING

Carrier Conveyor Corp., 2144 Frankfort Ave., Louisville, Ky.

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Robins Conveyors Div., Hewitt-Robins, Inc., 270 Passaic Ave., Passaic, N. J. (ADV., pg 18-19)

Simplicity Engineering Co., Durand, Mich.

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Syntron Co., 408 Lexington, Homer City, Pa.

SCREW AND SPIRAL

C. O. Bartlett & Snow Co., 6300 Harvard Ave., Cleveland 5, Ohio

Continental Gin Co., 4500 5th Ave., S., Birmingham, Ala. (ADV., pg 129)

Fairmont Machinery Co., Fairmont, W. Va. (Adv., pg 82-83)

Hardinge Co., 240 Arch St., York, Pa.

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg. 81, Back Cover)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Sprout, Waldron & Co., 100 Sherman St., Muncy, Pa.

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

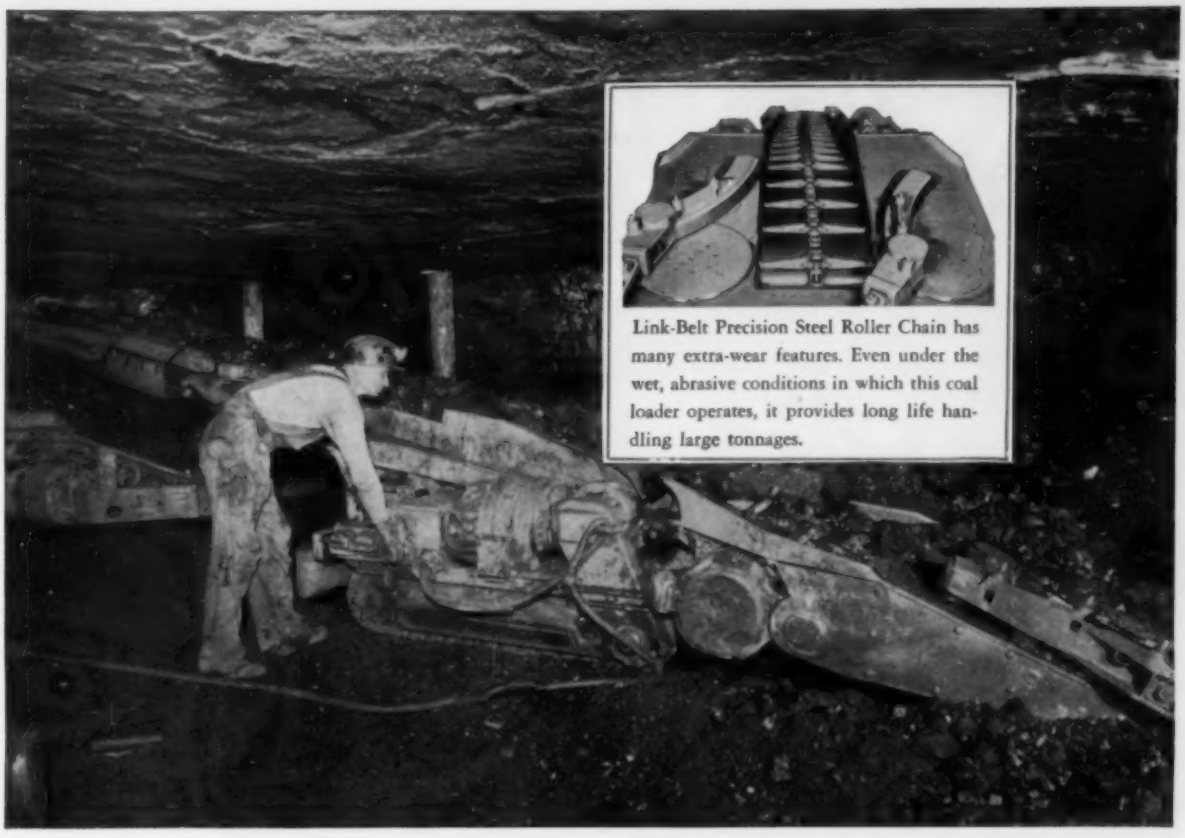
Webster Mfg. Co., Tiffin, Ohio

Spiral Lowering—See Chutes

Stocking & Reclaiming—See Storage and Reclamation

Couplings—See Power Transmission, Valves & Fittings

Continued on pg 84



Link-Belt Precision Steel Roller Chain has many extra-wear features. Even under the wet, abrasive conditions in which this coal loader operates, it provides long life handling large tonnages.

What is the right chain for your drive or conveying job?

Typical chains from the complete LINK-BELT line



Ewart Detachable Link-Belt, in malleable or Promal, for drives and power transmission.



Class H Pintle chain—excellent for conveyors that slide because of broad wearing surfaces.



Malleable roller chain for conveyors or inclined elevators where reduced chain pull is desired.



Rivetless chain of forged steel, flexible in both planes, is used for flight and drag conveyors.

You'll find the answer in LINK-BELT's complete chain line... a size and type for every need

WHETHER it's a high-hp, heavy-impact drive or relatively slow-speed conveying service—you can get the *one* chain that best meets your needs from Link-Belt's complete chain line. Our engineers will be glad to work with you—help you select the right chain for your requirements. And you can be sure that any Link-Belt chain you buy is quality-built for longer life.

LINK-BELT

CHAINS AND SPROCKETS

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities. 13.13

Something Extra with every

Modern coal markets demand exacting performance from coal preparation facilities . . . performance which must go hand-in-hand with economy to produce competitive upgraded coal. That's why Fairmont-built Preparation Plants give you the added advantages of something extra . . .

EXTRA ECONOMY through COORDINATED RESPONSIBILITY

Fairmont facilities are geared to completely design, engineer, fabricate and erect your preparation plant . . . pilot crews are available to aid in instructing your own crews . . . equipment is specified to meet your specific requirements. Fairmont's coordinated responsibility provides you with greater initial economy through *planned engineering* and erection.

EXTRA OPERATING EFFICIENCY

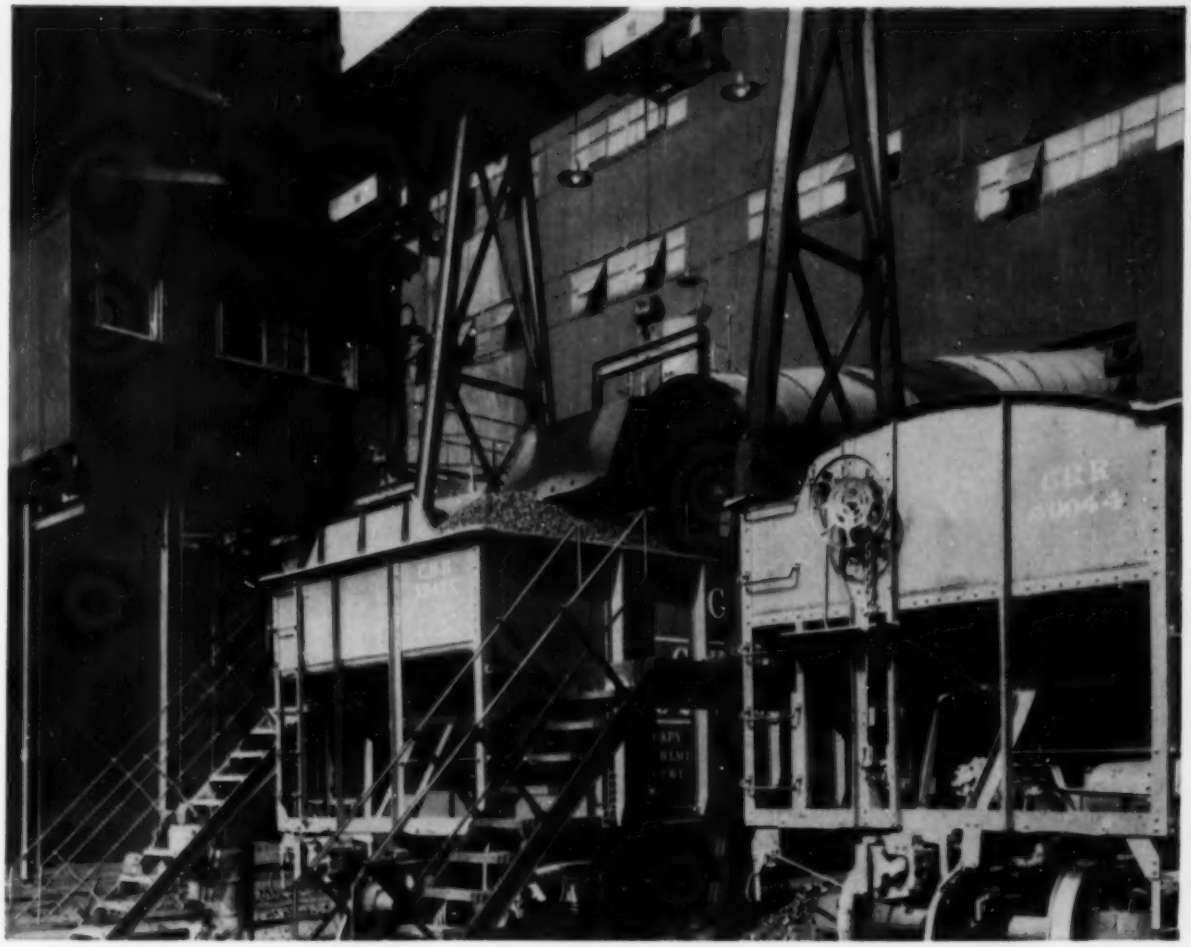
Fairmont plants are designed to meet your present production needs while providing for future requirements . . . a must in today's picture of anticipated production methods. Extra emphasis is placed on upgrading your coal to meet premium market demands while minimizing waste and displaced material.

When you have a preparation problem, do as others have done—let Fairmont assume the full responsibility of providing the plant that guarantees product uniformity and over 99% separating efficiency through an extra wide product size range of ⅛" to 10" in any tonnage capacity.

CALL a FAIRMONT Engineer!



FAIRMONT PREPARATION PLANT



That Something Extra in this Fairmont-Built Preparation Plant, operating at a modern Virginia mine, produces 12,000 tons of clean coal per day.

FAIRMONT MACHINERY COMPANY

FAIRMONT, WEST VIRGINIA

DESIGNERS AND CONSTRUCTORS OF COMPLETE COAL PREPARATION PLANTS USING BOTH WET AND DRY CLEANING CENTRIFUGAL AND THERMAL DRYING.

Preparation Buying Guide . . .

Crushers

HAMMER

American Pulverizer Co., 1275 Macklind Ave., St. Louis 10, Mo. (ADV., pg 118)

Gruendler Crusher & Pulverizer Co., 2917 Market St., St. Louis, Mo. (ADV., pg 152)

Hammermills, Inc., 4700 W. Division St., Chicago 51, Ill.

Heyl & Patterson, Inc., 55 Ft. Pitt Ave., Pittsburgh 22, Pa. (ADV., pg 86-87)

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Kennedy-Van Saun Mfg. & Engr. Corp., 2 Park Ave., New York 16, N. Y.

Klockner-Humboldt-Deutz AG, Koln, Germany (ADV., pg 120)

McLanahan & Stone Corp., Hollidaysburg, Pa. (ADV., pg 99)

Pennsylvania Crusher Co., 1711 Liberty Trust Bldg., Philadelphia 7, Pa. (ADV., pg 148)

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Sturtevant Mill Co., 14 Harrison Sq., Boston 22, Mass.

Universal Engineering Corp., Cedar Rapids, Iowa

Williams Patent Crusher & Pulverizer Co., 2701 W. Broadway, St. Louis 6, Mo.

RING

American Pulverizer Co., 1275 Macklind Ave., St. Louis 10, Mo. (ADV., pg 118)

Gruendler Crusher & Pulverizer Co., 2917 N. Market St., St. Louis 6, Mo. (ADV., pg 152)

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Pennsylvania Crusher Co., 1711 Liberty Trust Bldg., Philadelphia 7, Pa. (ADV., pg 148)

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Williams Patent Crusher & Pulverizer Co., 2701 N. Broadway, St. Louis 6, Mo.

ROLL, SINGLE & DOUBLE

Bonded Scale & Machine Co., 2176 S. Third St., Columbus 7, Ohio

Denver Equipment Co., 1414 17th St., Denver 17, Colo.

Gruendler Crusher & Pulverizer Co., 2917 Market St., St. Louis 6, Mo. (ADV., pg 152)

T. J. Gundlach Machine Co., 226 Centerville Ave., Belleville, Ill. (ADV., pg 150)

Heyl & Patterson, Inc., 55 Ft. Pitt Blvd., Pittsburgh 22, Pa. (ADV., pg 86-87)

Iowa Mfg. Co., 916 N. 16th St., Cedar Rapids, Iowa

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Kennedy-Van Saun Mfg. & Engr. Co., 2 Park Ave., New York 16, N. Y.

Klockner-Humboldt-Deutz AG, Koln, Germany (ADV., pg 120)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Lippman Engineering Works, 4603 W. Mitchell St., Milwaukee 14, Wis.

McLanahan & Stone Corp., Hollidaysburg, Pa. (ADV., pg 99)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Pennsylvania Crusher Co., 1711 Liberty Trust Bldg., Philadelphia 7, Pa. (ADV., pg 148)

Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn.

Ridge Equipment Co., Fallentimber, Pa. (ADV., pg 126)

Scottdale Machine, Foundry & Construction Co., Scottdale, Pa.

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Universal Engineering Corp., Cedar Rapids, Iowa.

Webster Mfg. Co., Tiffin, Ohio

Wilmot Engineering Co., Markle Bank Bldg., Hazleton, Pa. (ADV., pg 91)

TWO-STAGE

T. J. Gundlach Machine Co., 226 Centerville Ave., Belleville, Ill. (ADV., pg 150)

Cyclones

Dorr Co., Barry Place, Stamford, Conn. (ADV., pg 128)

Equipment Engineers, Inc., 41 Sutter St., San Francisco, Calif.

Heyl & Patterson, Inc., 55 Ft. Pitt Blvd., Pittsburgh 22, Pa. (ADV., pg 86-87)

Oliver United Filters, Inc., 33 W. 42nd, New York 17, N. Y. (ADV., pg 143)

K. Prins & Associates, Box 46, Wellston, Ohio

Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y.

Peterson Filters & Engr. Co., 137 Motor Ave., Salt Lake City, Utah.

Designers—See Consultants, Preparation Builders.

Driers

CENTRIFUGAL

Bird Machine Co., So. Walpole, Mass. (ADV., pg 52)

Centrifugal & Mechanical Industries, Inc., 146 President St., St. Louis, Mo. (ADV., Insert fol. pg 92)

Heyl & Patterson, Inc., 55 Ft. Pitt Blvd., Pittsburgh 22, Pa. (ADV., pg 86-87)

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

McNally Pittsburgh Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

N. V. Tema, 1 Nassaulaan, 'S-Gravenhage, Holland.

HEAT

Allis-Chalmers Mfg. Co., 888 S. 70th St., Milwaukee 1, Wis. (ADV., pg 101, 123, 164)

Colorado Iron Works Co., 1620 17th St., Denver 2, Colo. (ADV., pg 98)

Combustion Engineering — Superheater, Inc., 1323 N. Branch St., Chicago 22, Ill. (ADV., pg 163)

Dorr Co., Barry Place, Stamford, Conn. (ADV., pg 128)

General American Transportation Corp., 135 S. LaSalle St., Chicago 90, Ill.

Hardinge Co., York, Pa.

Heyl & Patterson, Inc., 55 Ft. Pitt Blvd., Pittsburgh 22, Pa. (ADV., pg 86-87)

Robt. Holmes & Bros., Inc., 520 Junction Ave., Danville 1, Ill. (ADV., pg 85)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y.

Vulcan Iron Works, Wilkes-Barre, Pa. (ADV., pg 215).

Drives—See Power Transmission.

Dust Collectors

Allis-Chalmers Mfg. Co., 888 S. 70th St., Milwaukee 1, Wis. (ADV., pg 101, 123, 164)

American Air Filter Co., 193 Central Ave., Louisville 8, Ky. (ADV., pg 142)

American Blower Corp., 6000 Russell St., Detroit 32, Mich.

American Wheelabrator & Equipment Corp., Mishawaka, Ind.

Buell Engineering Co., 70 Pine St., New York 5, N. Y.

Combustion Engineering, Inc., Raymond Div., 1315 N. Branch St., Chicago 22, Ill.

Klockner - Humboldt - Deutz AG, Koln, Germany (ADV., pg 120)

Link-Belt Co., 307 No. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Northern Blower Co., 6410 Barberton Ave., Cleveland 2, Ill.

Pangborn Corp., 60 Pangborn Bldg., Hagerstown, Md. (ADV., pg 125)

Sturtevant Mill Co., 14 Harrison Sq., Boston 22, Mass.

Western Precipitation Corp., 1016 W. 9th St., Los Angeles 15, Calif.

Dustproofing

CALCIUM CHLORIDE

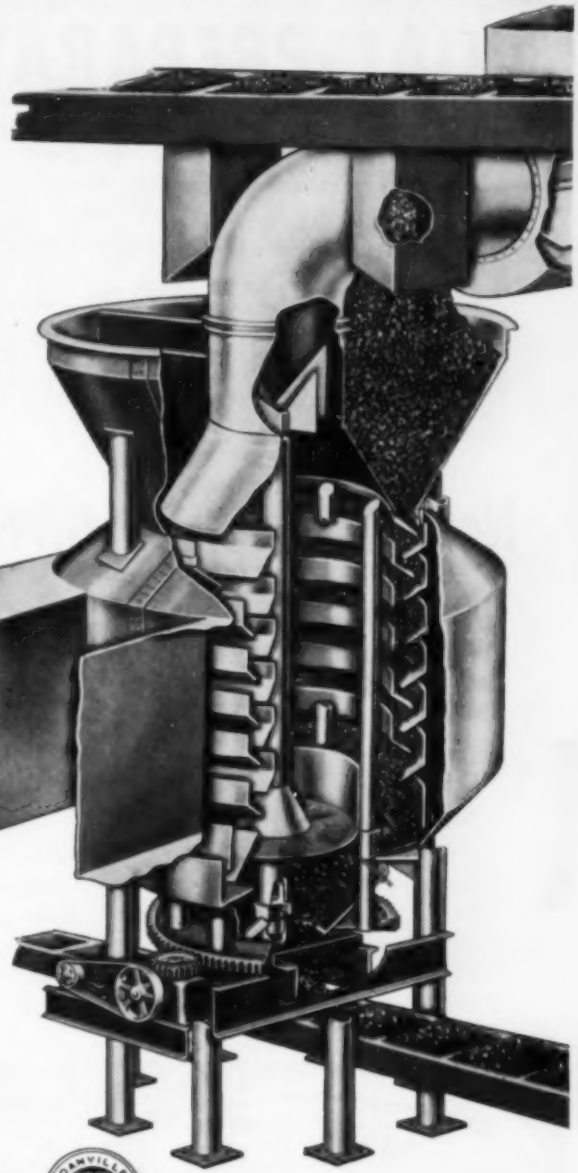
Dow Chemical Co., Midland, Mich.

Continued on pg 88

Baughman

DRY up to 60 tons of COAL per hour in one pass...

VERTI-VANE THERMAL COAL DRYER

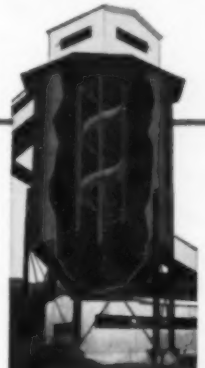


AT LOW INITIAL COST... LOW OPERATING COST, the Baughman Verti-Vane Drying Unit delivers a uniformly dried and well-mixed product with practically no degradation.

Each unit is designed for capacities ranging from 15 to 60 tons per hour, and handles all coal sizes from 1½" down. Reduces surface moisture to approximately 2% in a single, continuous operation. No re-run is ever necessary.

A minimum of moving parts and slow-speed operation tend to eliminate shift breakdowns and keep replacement costs to a minimum. Controls are easily adjusted for various feed conditions so that operation of the unit requires very little attention.

For Free Catalog No. 101 and Complete Information Write Dept. A-31



Stop Breakage Losses with

HOLMES LOWERING SPIRALS

Eliminates droppage that degrades your coal. Saves wear and tear on bins. Costs nothing to operate (gravity operated). Centrifugal force is utilized to hold coal on spiral . . . inside edge or "lip" on spiral is unnecessary . . . allows coal to slide gently off and spread evenly upon reaching peak of pile. Coal flow on spiral is automatically controlled and remains within "safe" speed limits regardless of distance of travel.

ROBERT HOLMES & BROS., Inc.

DANVILLE • ILLINOIS

Manufacturers of: SHEAVES, TIPPLE EQUIPMENT, CAGES, SKIPS, LOWERING SPIRALS, CAR PULLERS AND RETARDERS, DRYERS, LABORATORY CRUSHERS, HOISTS, VIBRATING SCREENS, DUSTOLATORS.

For Over 60 Years

Heyl & Patterson Has Been Solving COAL PREPARATION PROBLEMS

During this period H & P has designed and built coal preparation facilities of all types to meet the needs of the coal industry.

To find new answers to old problems the Research and Development Department of Heyl & Patterson is constantly searching for new products, new methods and new improvements to meet the coal industry's need for higher production at lower cost.

Whether your preparation requirements concern a complete new plant, the modernization of your old plant, recovery of fine coal, closing your water circulating system, or replacing equipment to increase production . . . it will pay you to place your problem in the experienced hands of Heyl & Patterson to find the most practical answer to meet your needs.

Heyl & Patterson Offers You Complete Service

EXPERIENCE

Heyl & Patterson has designed and built a great variety of coal preparation facilities during the last 60-odd years.

DESIGN, FABRICATION AND ERECTION FACILITIES

With our own Engineering Department, our own Research Department, our own Fabricating Department and our own Erection Department, Heyl & Patterson has the ability and facilities to do your complete job from beginning to end. For you this means just one responsibility controlling every phase of production.

SERVICE FACILITIES

The Heyl & Patterson Service Department is geared to provide you with spare or replacement parts of any type quickly and precisely.

RESEARCH FACILITIES

The Heyl & Patterson Research Laboratory is prepared and equipped to investigate your problem in order to recommend the most efficient and economical type of coal preparation facilities.

Ask a
Heyl & Patterson Engineer
to consult with you about

COMPLETE COAL PREPARATION PLANTS

- Cyclone Thickeners
- Coal and Coke Handling Equipment
- Rotary Mine Car Dumpers
- Coal Storage Bridges
- Bradford Breakers
- Reineveld Fine Coal Dryers
- Thermal Dryers
- Olivo Moisture Meters
- Coal Crushers
- Thorsten Coal Samplers

Heyl+Patterson

COAL PREPARATION EQUIPMENT

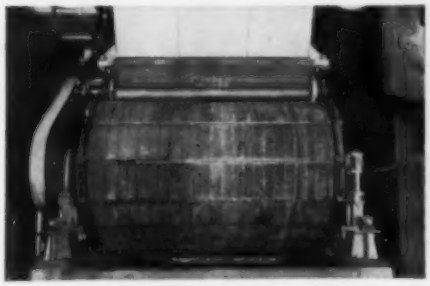


H & P CYCLONE THICKENERS

. . . for efficient, low-cost thickening, classifying, clarifying and desliming. H & P Cyclones can give you Recovery of Marketable Coal from Wasted Sludge; Closed Circuit Operations; Better Froth Product; and Perfect Control of Circulating Water. H & P Cyclones are available in sizes of 3", 8", and 14" diameter.

H & P THERMAL DRYER

. . . designed to handle stoker and slack size coal having a bottom size of 1½ mm. Coal is carried by a pallet-type conveyor into the drying chamber where hot gases are passed through the coal in both directions. Danger of damage by degradation is eliminated and no dust-recovery system is needed.



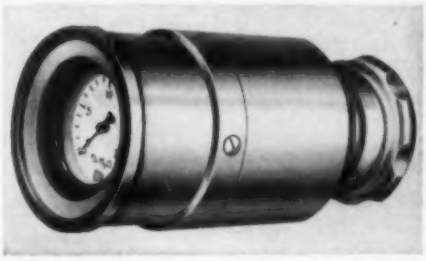


REINEVELD CENTRIFUGAL DRYER

. . . A compact, highly-efficient, time-tested and proven machine for the drying of fine coals. Outstanding features: Less degradation of coal; less floor space; lower moisture in dried coal (5-7%); capacity of 50-75 tons per hour; lower installation and maintenance costs.

OLIVO MOISTURE METER

. . . An accurate, precise moisture-measuring instrument that makes moisture testing a matter of minutes instead of hours. Simple and easy to operate, the portable Olivo Moisture Meter can determine the moisture content of any powdered, granulated or fibrous materials (except those that react with calcium carbide) in less than two minutes.



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"SINCE 1887"

Heavy Bulk Materials Handling Equipment

All The Way from Design to Erection

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Preparation Buying Guide . . .

Calcium Chloride (Cont'd)

Solvay Process Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6. N. Y.

Wyandotte Chemicals Corp., Wyandotte, Mich.

COMPOUNDS

Columbia Chemical Div., Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh 19, Pa.

Dow Chemical Co., Midland, Mich.

Johnson-March Corp., 1724 Chestnut St., Philadelphia 3, Pa.

Midland Sealtite Corp., Midland Bldg., Cleveland 15, Ohio.

EQUIPMENT

C O. Bartlett & Snow Co., 6200 Howard Ave., Cleveland 5, Ohio

Brown-Fayro Co., 940 Ash St., Johnstown, Pa. (ADV., pg 144)

Dustlix Systems, Inc., 715 N. Van Buren St., Milwaukee, Wis.

Viking Machinery Sales Corp., 219 E. Washington St., Jackson, Mich. (ADV., pg 159)

SPRAY OILS

Ashland Oil & Refining Co., 1409 Winchester Ave., Ashland, Ky. (ADV., pg 96-97)

Conewango Refining Co., 760 Market St., Warren, Pa.

Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.

Pure Oil Co., 35 E. Wacker Dr., Chicago 7, Ill.

Shell Oil Co., 50 W. 50th St., New York 20, N. Y.

Sinclair Refining Co., 630 Fifth Ave., New York 20, N. Y. (ADV., pg 127)

Socony-Vacuum Oil Co., 26 Broadway, New York 4, N. Y.

Standard Oil Co. (Ind.), 910 S. Michigan Ave., Chicago 80, Ill. (ADV., pg 138)

Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa. (ADV., pg 228)

Texas Co., 405 Lexington Ave., New York 17, N. Y. (ADV., pg 6-7)

Electrical Equipment

CONTROLLERS, MOTOR STARTERS

Allen-Bradley Co., 1322 S. Second St., Milwaukee 4, Wis.

Allis-Chalmers Mfg. Co., 888 S. 70th St., Milwaukee 1, Wis. (ADV., pg 101, 123, 164)

Clark Controller Co., 1146 E. Third St., Cleveland 10, Ohio

Cutler-Hammer, Inc., 1410 W. St. Paul Ave., Milwaukee 1, Wis.

Durakool Inc., Elkhart, Ind. (ADV., pg 139)

Electric Controller & Mfg. Co., 2701 E. 79th St., Cleveland 4, Ohio

Electric Machinery Mfg. Co., 821 2nd Ave., S.E., Minneapolis 13, Minn.

General Electric Co., Schenectady 5, N. Y. (ADV., pg 30, 38-39)

Square D Co., 6060 Rivard St., Detroit, Mich.

Trumbull Electric Dept., General Electric Co., Plainville, Conn.

Ward Leonard Electric Co., 23 South St., Mt. Vernon, Ill.

Westinghouse Electric Corp., 401 Liberty Ave., Pittsburgh 30, Pa. (ADV., Insert fol. pg 108)

INSTALLATION CONTRACTORS

West Virginia Electrical Co., 208 Newton St., Fairmont, W. Va. (ADV., pg 151)

MOTORS, GEARMOTORS

Allis-Chalmers Mfg. Co., 888 S. 70th St., Milwaukee 1, Wis. (ADV., pg 101, 123, 164)

Louis Allis Co., 427 E. Stewart St., Milwaukee 7, Wis.

Century Electric Co., 1806 Pine St., St. Louis 3, Mo.

Crocker-Wheeler Div., Elliott Co., Ampere 5, N. J.

Electric Machinery Mfg. Co., 821 2d Ave., S. E., Minneapolis 13, Minn.

Elliott Co., Ridgeway Div., Ridgeway, Pa.

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

General Dynamics Corp., Electro-Dynamics Div., 155 Ave. A., Bayonne, N. J. (ADV., pg 114)

General Electric Co., Schenectady 5, N. Y. (ADV., pg 30, 38-39)

Reliance Electric & Engr. Co., 1076 Ivanhoe Rd., Cleveland 10, Ohio (ADV., pg 133)

Robbins & Myers, Inc., 1930 Clark Blvd., Springfield, Ohio

U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, Calif.

Wagner Electric Corp., 6479 Plymouth Ave., St. Louis 14, Mo.

Westinghouse Electric Corp., 401 Liberty Ave., Pittsburgh 30, Pa. (ADV., Insert fol. pg 108)

SWITCHGEAR

Allis-Chalmers Mfg. Co., 888 S. 70th St., Milwaukee 1, Wis. (ADV., pg 101, 123, 164)

Delta-Star Electric Co., 2400 Fulton St., Chicago 12, Ill.

General Electric Co., Schenectady 5, N. Y. (ADV., pg 30, 38-39)

I-T-E Circuit Breaker Co., 19th & Hamilton St., Philadelphia 30, Pa.

Westinghouse Electric Corp., 401 Liberty Ave., Pittsburgh 30, Pa. (ADV., Insert fol. pg 108)

TRANSFORMERS

Allis-Chalmers Mfg. Co., 888 S. 70th St., Milwaukee 1, Wis. (ADV., pg 101, 123, 164)

General Electric Co., Schenectady 5, N. Y. (ADV., pg 30, 38-39)

Pennsylvania Transformer Co., 808 Ridgeway Ave., Pittsburgh 12, Pa.

Wagner Electric Corp., 6479 Plymouth Ave., St. Louis 14, Mo.

Westinghouse Electric Corp., 401 Liberty Ave., Pittsburgh 30, Pa. (ADV., Insert fol. pg 108)

WIRE & CABLE

American Steel & Wire Div., U. S. Steel Corp., Rockefeller Bldg., Cleveland 13, Ohio (ADV., pg 12-13, 24-25, 77)

Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.

Ansonia Electrical Div., Noma Electric Corp., Ansonia, Conn.

Collyer Insulated Wire Co., 245 Roosevelt Ave., Pawtucket, R. I.

Crescent Insulated Wire & Cable Co., Olden & Taylor Aves., Trenton 5, N. J.

General Cable Corp., 420 Lexington Ave., New York 17, N. Y.

General Electric Co., Construction Materials Div., 1285 Boston Ave., Bridgeport 2, Conn. (ADV., pg 50)

Habirshaw Wire & Cable Div., Phelps Dodge Copper Products Co., 40 Wall St., New York 5, N. Y.

Hazard Insulated Wire Works Div., Okonite Co., Wilkes-Barre, Pa. (ADV., pg 243)

Kaiser Aluminum & Chemical Co., 1924 Broadway, Oakland 12, Calif.

Rockbestos Products Corp., 258 Nicoli St., New Haven 4, Conn. (ADV., pg 254)

John A. Roebling's Sons Co., Trenton 2, N. J. (ADV., pg 47)

Rome Cable Corp., 330 Ridge St., Rome, N. Y. (ADV., pg 28-29)

Simplex Wire & Cable Co., 79 Sidney St., Cambridge 39, Mass. (ADV., pg 231)

Triangle Conduit & Cable Co., New Brunswick 1, N. J.

United States Rubber Co., 1230 Ave. of the Americas, New York 20, N. Y. (ADV., Third Cover)

Western Insulated Wire Co., 2425 E. 30th St., Los Angeles, Calif.

Elevators & Buckets

Atlas Conveyor Co., Clintonville, Wis.

Barber-Greene Co., 400 N. Highland Ave., Aurora, Ill. (ADV., pg 126)

Chain Belt Co., 4786 W. Greenfield Ave., Milwaukee 1, Wis. (Adv., pg 247)

Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Continental Gin Co., 4500 Fifth Ave., S., Birmingham, Ala. (ADV., pg 129)

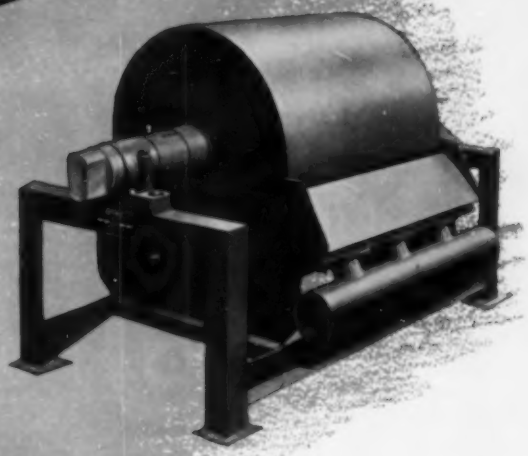
Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

Helmick Foundry-Machine Co., Fairmont, W. Va.

MODERN PREPARATION PLANTS ARE JEFFREY EQUIPPED



Jeffrey Double Roll 30" x 36" Crusher showing V-Belt drive between rolls.



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CRUSHERS	LOADING BOOMS
WASHERS	CONVEYORS
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Preparation Buying Guide . . .

Elevators, Buckets (Cont'd)

Iowa Mfg. Co., 916 N. 16th St., Cedar Rapids, Iowa

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Kanawha Mfg. Co., Box 1786, Charleston, W. Va. (ADV., pg 95)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Lippman Engineering Works, 4603 W. Mitchell St., Milwaukee 14, Wis.

McLanahan & Stone Corp., Hollidaysburg, Pa. (ADV., pg 99)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., Insert fol. pg 76)

Robins Conveyors Div., Hewitt-Robins, Inc., 270 Passaic Ave., Passaic, N. J. (ADV., pg 18-19)

Sprout, Waldron & Co., 100 Sherman St., Muncy, Pa.

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Webster Mfg. Co., Tiffin, Ohio

Western Machinery Co., 760 Folsom St., San Francisco 7, Calif. (ADV., pg 79)

Wilmot Engineering Co., Markle Bank Bldg., Hazleton, Pa. (ADV., pg 91)

Engineers—See Consultants, Preparation Builders

Fabrication, Steel & Equipment

(See also Preparation Builders)

R. C. Mahon Co., Detroit 34, Mich. (ADV., pg 103)

Vulcan Iron Works, Wilkes-Barre, Pa. (ADV., pg 215)

Feeders

APRON

Allis-Chalmers Mfg. Co., 888 S. 70th St., Milwaukee 1, Wis. (ADV., pg 101, 123, 164)

Chain Belt Co., 4786 W. Greenfield Ave., Milwaukee 1, Wis. (ADV., pg 247)

Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Continental Gin Co., 4500 Fifth Ave., S., Birmingham, Ala. (ADV., pg 129)

Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McLanahan & Stone Corp., Hollidaysburg, Pa. (ADV., pg 99)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., Insert fol. pg. 76)

Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn.

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Traylor Engineering & Mfg. Co., Allentown, Pa.

Webster Mfg. Co., Tiffin, Ohio

Wilmot Engineering Co., Markle Bank Bldg., Hazleton, Pa. (ADV., pg 91)

RECIPROCATING

Bonded Scale & Machine Co., 2176 S. Third St., Columbus 7, Ohio

Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

Robt. Holmes & Bros., Inc., 520 Junction Ave., Danville 1, Ill. (ADV., pg 85)

Iowa Mfg. Co., 916 N. 16th St., Cedar Rapids, Iowa

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Kanawha Mfg. Co., Box 1786, Charleston, W. Va. (ADV., pg 95)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McLanahan & Stone Corp., Hollidaysburg, Pa. (ADV., pg 99)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., Insert fol. pg 76)

Robins Conveyors Div., Hewitt-Robins, Inc., 270 Passaic Ave., Passaic, N. J. (ADV., pg 18-19)

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Traylor Engineering & Mfg. Corp., Allentown, Pa.

Webster Mfg. Co., Tiffin, Ohio

VIBRATING

Carrier Conveyor Corp., 2144 Frankfort Ave., Louisville, Ky.

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill. (ADV., pg 81, Back Cover)

Robins Conveyors Div., Hewitt-Robins, Inc., 270 Passaic Ave., Passaic, N. J. ADV., pg 18-19)

Syntron Co., 408 Lexington, Homer City, Pa.

Filters

CENTRIFUGAL

Bird Machine So., S. Walpole, Mass. (ADV., pg 52)

DISK, DRUM, VACUUM

Eimco Corp., 634 S. 4th West St., Salt Lake City 10, Utah (ADV., pg 145)

General American Transportation Co., 135 S. LaSalle St., Chicago 90, Ill.

Morse Bros. Machinery Co., 2900 Brighton Blvd., Denver, Colo.

Oliver United Filters, Inc., 33 W. 42d St., New York 18, N. Y. (ADV., pg 143)

Peterson Filters & Engr. Co., 137 Motor Ave., Salt Lake City 1, Utah

Denver Equipment Co., 1414 17th St., Denver 17, Colo.

Freezeproofing Materials

CALCIUM CHLORIDE

Dow Chemical Co., Midland, Mich.

Solvay Process Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

Wyandotte Chemicals Corp., Wyandotte, Mich.

COMPOUNDS

Morton Salt Co., 120 S. LaSalle St., Chicago 3, Ill.

SALT

International Salt Co., Scranton 2, Pa.

Morton Salt Co., 120 S. LaSalle St., Chicago 3, Ill.

Froth Flotation

MACHINES, AUXILIARY EQUIPMENT

Booth Engineering Co., 146 S. W. Temple St., Salt Lake City 1, Utah

Denver Equipment Co., 1414 17th St., Denver 17, Colo.

Galigher Co., Box 209, Salt Lake City 4, Utah

General American Transportation Corp., 135 S. LaSalle St., Chicago 90, Ill.

Heyl & Patterson, Inc., 55 Ft. Pitt Blvd., Pittsburgh 22, Pa. (ADV., pg 86-87)

Klockner-Humboldt-Deutz AG, Koln, Germany (ADV., pg 120)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Mine & Smelter Supply Co., 1422 17th St., Denver 17, Colo.

Morse Bros. Machinery Co., 2900 Brighton Blvd., Denver, Colo.

Peterson Filters & Engineering Co., 137 Motor Ave., Salt Lake City 1, Utah

Roberts & Schaefer Co., 130 N. Wells St., Chicago 6, Ill. (ADV., pg 112)

Western Machinery Co., 760 Folsom St., San Francisco 7, Calif, (ADV., pg 79)

Wilmot Engineering Co., Markle Bank Bldg., Hazleton, Pa. (ADV., pg 91)

Furnaces, Heat Drying

Bigelow-Liptak Corp., 327 Curtis Bldg., Detroit, Mich.

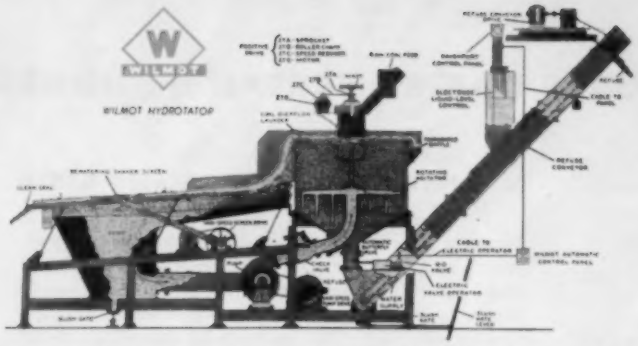
George P. Reintjes Co., 2517 Jefferson St., St. Louis, Mo.

FIRING EQUIPMENT

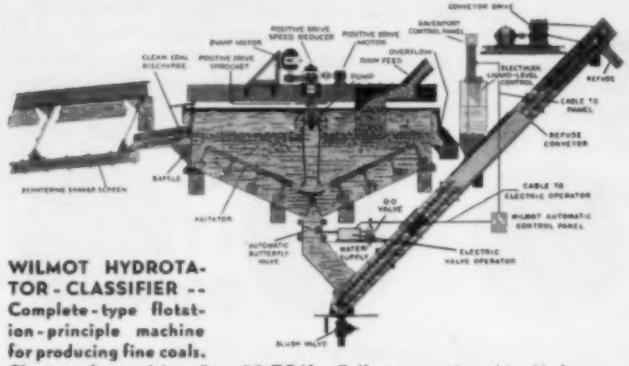
Hoffman Combustion Engineering Co., Marquette Bldg., Detroit, Mich.

Continued on pg 94

WILMOT
Hydrotator and Heavy Media Automatic, Complete Units
for every coal-cleaning purpose



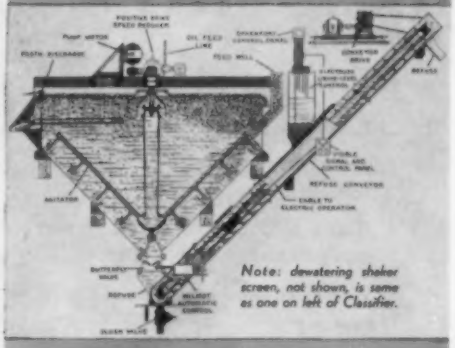
WILMOT HYDROTATOR -- Complete-type cleaning machine based on "Hindered Settling" principle. Fully automatic; one man maintains a battery. For bituminous and anthracite down to + 3/64" mesh. Clean coal capacities, 5 to 150 tons per hour.



WILMOT HYDROTATOR - CLASSIFIER -- Complete-type flotation-principle machine for producing fine coals. Clean coal capacities, 5 to 50 TPH. Fully automatic: this, Hydrotator and Froth-Flotation units are equipped with visible or audible signals.

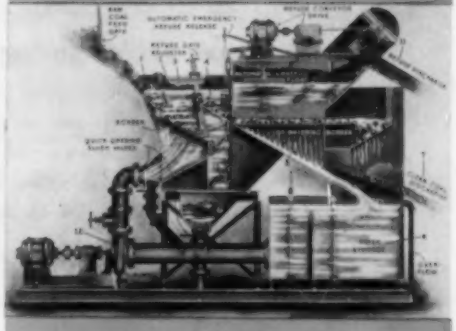


WILMOT HEAVY-DENSITY UNIT -- Introducing radical simplicity, this machine represents a marked advancement in the heavy-media method. 6 types; 9 sizes for clean coal capacities of 50 to 800 TPH, bituminous or anthracite.



Note: dewatering shaker screen, not shown, is same as one on left of Classifier.

MODIFIED FROTH-FLOTATION UNIT -- Recovers fines from sludge. Complete in one unit, it effects substantial savings in floor space. 4 standard models for clean coal capacities of 9 to 80 TPH.



WILMOT HYDRO-SEPARATOR -- Complete type machine for cleaning low-gravity anthracite and bituminous. Semi-automatic; one man operates. Models in sizes from 24" to 72".

For Details SEND FOR BULLETINS

OTHER WILMOT PRODUCTS

Cell Froth Flotation
Simplex Jigs
Crusher Rolls
Sizing Shakers
Picking Tables
Dewatering Screens
Settling Tanks
Rivetless Chain Conveyors
Bucket Elevators

WILMOT ENGINEERING CO.
HAZLETON, PA.



HEATING NOT BEATING

CURES COSTLY SCREEN BLINDNESS

photo courtesy of Hewitt-Robins, Inc.

The practice of beating blinded screens, a temporary cure at best, runs up labor cost and causes excessive screen failure. Hanco Screen Heaters forever eliminate costly, inefficient sizing resulting from blinded screens.

SCREEN HEATING REDUCES SIZING COSTS

1. Labor cost is cut by elimination of cleaning labor!
2. Screen life is greatly extended for it is no longer damaged by manual cleaning!
3. Sizing is more accurate and faster for processing equipment can be operated at full capacity!

(Every Hanco installation has paid for itself in less than a year!)

EASY INSTALLATION ON ALL SCREEN MAKES

Hanco electric screen heaters are furnished as a complete kit—heater unit, lead cables, copper distribution and feed bars and skirt boards. All necessary small parts and complete instructions are included. Hanco units are designed to match original fittings. Speedy installation can be made by competent maintenance personnel.

HANCO QUICK-CHANGE ASSEMBLY

Available in five styles, Hanco quick-change assemblies assure easy cloth changes. Special skirt boards or tension rails incorporate a wedge type copper distribution bar that is bolted to but insulated from the rail itself. One of the five assemblies shown below is sure to fit your make of screen. Cloth changes are as easy or easier than on an unheated screen.

A-8074



HANCO SCREEN HEATER ADVANTAGES

1. Hanco heaters have a wide application for they heat brass, plain, stainless and monel steel screens.
2. Unique tap changing device allows screen temperature adjustment under load. This means added economy, for you can quickly adjust to seasonal or load demands.
3. Heater terminals are readily accessible for inspection or adjustment.
4. Compact heater units can be floor, wall or ceiling mounted.
5. There is always positive direct contact with the hook strip of the screen cloth.
6. All electrical contacts are shielded from abrasion.
7. Cloth changes are as quick and easy as they are on unheated screens.

HANCO HEATERS ARE AVAILABLE ON MOST NEW SCREEN EQUIPMENT

Send today for descriptive bulletin

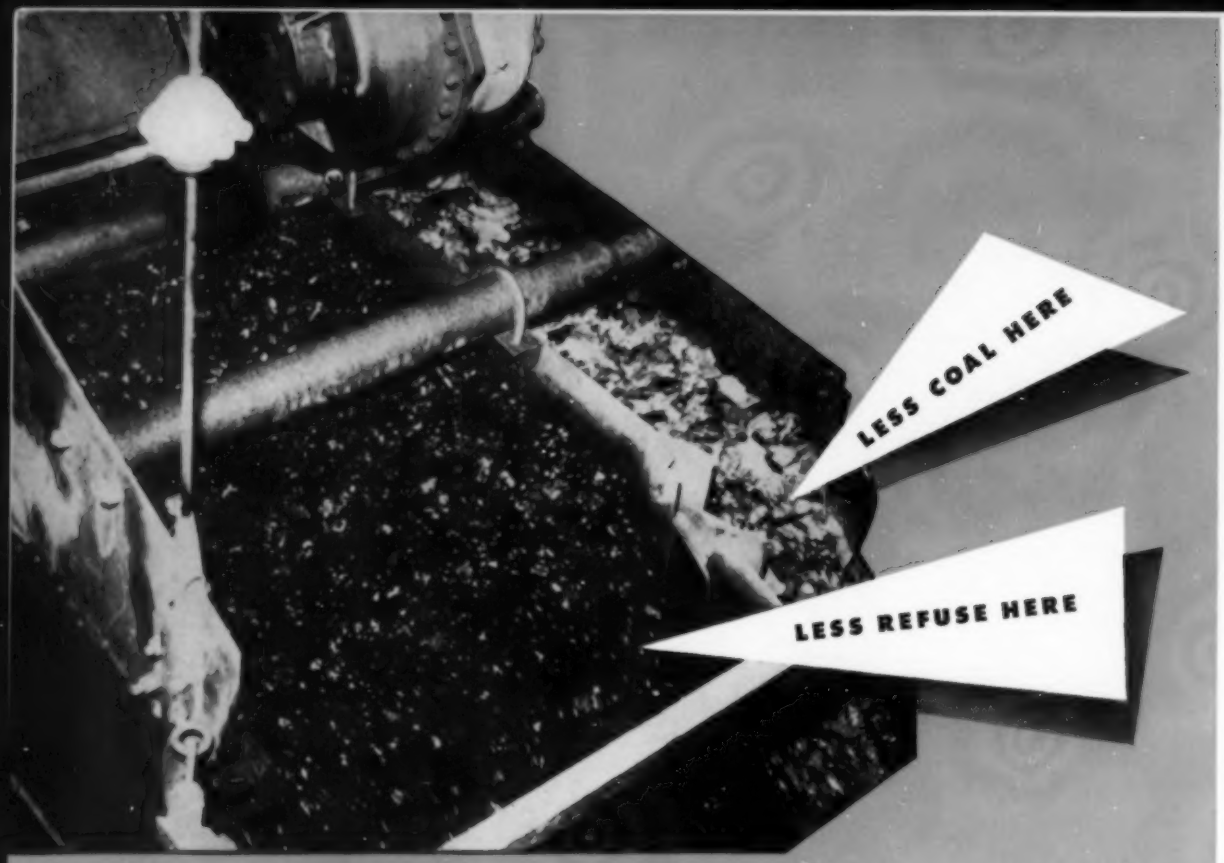
Hanco

the pioneer electric screen heater

F. R. HANNON & SONS • CANTON 7, OHIO

Engineers & Manufacturers Since 1926


C·M·I·
centrifugal
continuous
C·M·I·C·M·I·C·M·I·



Hard to believe - but true!

Heavy-Media Separation can add as much as

$40,000 A YEAR EXTRA PROFIT

on every 100 t.p.h. cleaned

FACT

Time and again, in comparative tests, Heavy-Media Separation recovers 2½ to 5% more low-ash coal from the same total-seam r.o.m. feed, i.e. 2½ to 5 tons more from every 100 t.p.h. cleaned.

FACT

Every ton lost to refuse costs you your out-of-pocket mining and tipple costs *plus* the income you would have had by shipping it. Conservatively, at today's costs and selling prices, just one ton an hour less coal in your refuse will add $20,000 a year to profit.*

*Based on 190 days, two shifts.

AMERICAN Cyanamid COMPANY

FACT

Over 1000 t.p.h. Heavy-Media Separation capacity operates solely on jig middlings, refuse and dumps. These plants operate commercially on what other methods lose to refuse!

FACT

No matter how your raw-feed fluctuates in tonnage, size-consist or percent of near-gravity material, Heavy-Media Separation can closely duplicate heavy-liquid washability results.

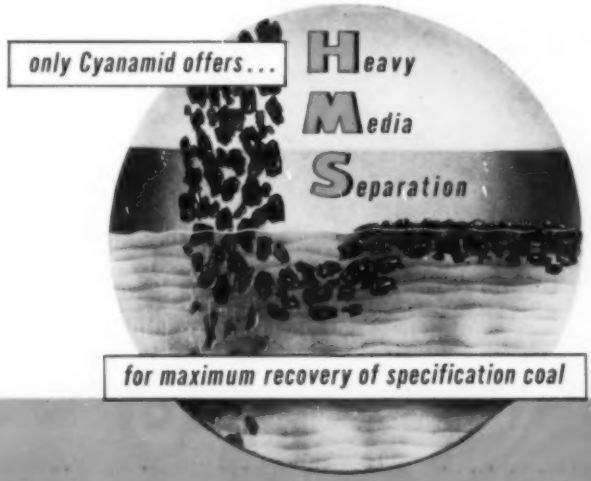
WHAT YOU SHOULD DO NOW

If you have a cleaning plant

Run heavy-liquid tests on your coal and refuse. Tell us shipping specifications you must meet or would like to meet. Ask us to estimate the cost and net profit on an H.M.S. Unit to supplement your present cleaners. It might be the best investment you ever made!

If you are considering a new plant

Talk things over with a Cyanamid Field Engineer. Let him give you unbiased data on what Heavy-Media Separation can do on your coal, what your capital and operating costs are likely to be. Get all the facts *first-hand* before you decide. A letter or phone call will get action.



MINERAL DRESSING DEPARTMENT 30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y.



TAPER-LOCK

A PATENTED PRODUCT OF DODGE

-OFF THE SHELF

NO REBORING!
NO KEYSEATING!
NO MACHINING!

Ready for the shaft, with no costly, time-consuming operations to make them fit. That's the big news about Dodge Taper-Lock Sprockets. Taper-Lock grips the shaft with the firmness of a shrunk-on fit, yet comes off easily. Bushings may be re-used. They come in sizes to meet most every application.

Taper-Lock Sprockets are available from Distributors' stocks in a complete range of B-type steel sprockets—½" to 1¼" pitch. Dodge quality Roller Chain is packaged in 10-foot lengths—also available in 50-foot and 100-foot reels. Save time—save money—keep production rolling—get Dodge Taper-Lock Sprockets and Roller Chain from your Dodge Distributor.

DODGE MANUFACTURING CORPORATION, 3000 Union St., Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor, for valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone directory, or write us.



THERE'S ONLY ONE TAPER-LOCK, THE BUSHING THAT MOUNTS FLUSH!



Standardize, economize with Taper-Lock, the bushing that is interchangeable in Dodge sprockets, sheaves, couplings and conveyor pulleys. *More than 2,000,000 in use!*

DODGE

of Mishawaka, Ind.

All ....OF THESE PROCESSES *Engineered*

FOR QUALITY PRODUCTION AT LOW COST IN ALL A&G PROJECTS

- Raw-Coal Storage
- Raw-Coal Blending
- Preliminary Breaking
- Rough Cleaning
- Raw-Coal Sizing
- Hand Picking
- Washing
- Air Cleaning
- Retreatment
- Salvage
- Clean-Coal Sizing
- Dewatering and Drying
- Crushing
- Rescreening
- Mixing and Blending
- Dustproofing
- Freezeproofing
- Loading
- Water Handling
- Sludge Recovery
- Refuse Disposal
- Power
- Maintenance
- Quality Control



Each A&G assignment is individually engineered so that your progressive coal production plans and requirements receive specialized planning. No past engineering project that we have been commissioned to do becomes a model for the design and construction of your property except in the fundamental engineering.

Each assignment given us is treated in accordance with its own specific problems with good, sound, basic engineering to build upon. In no case do we ever sell a "packaged" unit — A&G engineering not only designs and constructs to streamline today's production but in looking ahead to the future, includes flexibility into the operations.

We will contact you at any time that you are ready.



ALLEN & GARCIA COMPANY

CONSULTING AND CONSTRUCTION ENGINEERS

- 332 S. MICHIGAN AVE., CHICAGO 4, ILL.
- 120 WALL ST., NEW YORK 5, N. Y.

Preparation Buying Guide . . .

Firing Equipment (Cont'd)

Iron Fireman Mfg. Co., 8170 W. 106th St., Cleveland 11, Ohio

Gates

Blaw Knox Co., Farmers Bank Bldg., Pittsburgh, Pa.

C. S. Card Iron Works, Denver 1, Colo.

Chain Belt Co., 4786 W. Greenfield Ave., Milwaukee 1, Wis. (ADV., pg 247)

Robt. Holmes & Bros., Inc., 520 Junction Ave., Danville 1, Ill. (ADV., pg 85)

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1. Ill. (ADV., pg 81, Back Cover)

Lippman Engineering Works, 4603 W. Mitchell St., Milwaukee 14, Wis.

McLanahan & Stone Corp., Hollidaysburg, Pa. (ADV., pg 99)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Traylor Engineering & Mfg. Co., Allentown, Pa.

Webster Mfg. Co., Tiffin, Ohio

Wilmot Engineering Co., Markle Bank Bldg., Hazleton, Pa. (ADV., pg 91)

Gears—See Power Transmission

Heat Driers—See Driers

Heaters—See Heating Equipment, Plant; also Screen Heaters

Heating Equipment, Plant

HEATING PLANTS

E. K. Campbell, 1606 Main St., Kansas City, Mo.

Dravo Corp., Dravo Bldg., Pittsburgh 22, Pa.

Terre Haute Boiler Co., Terre Haute, Ind.

STEAM, STEAM-ELECTRIC RADIATORS

Burnham Corp., Electric Radiator Dept., Zanesville, Ohio

UNIT HEATERS

ILG Electric Ventilating Co., 2840 N. Crawford Ave., Chicago 41, Ill.

Trane Co., 200 Cameron, La Crosse, Wis.

Buffalo Forge Co., 500 Broadway, Buffalo, N. Y.

Clarage Fan Co., Kalamazoo, Mich.

Heavy Density, Heavy Media, Etc.—See Washers

Hoists

BOOM

American Chain & Cable Co., Wright Hoist Div., Princess & Charles Sts., York, Pa. (ADV., pg 33)

Chisholm-Moore Hoist Corp., 5045 Fremont Ave., Tonawanda, N. Y.

Harnischfeger Corp., 4400 W. Natl. Ave., Milwaukee 14, Wis. (ADV., pg 31)

Robbins & Myers, Inc., 1930 Clark Blvd., Springfield, Ohio

LAYER-LOADING

Brown-Fayro Co., 940 Ash St., Johnstown, Pa. (ADV., pg 144)

PORTABLE, MAINTENANCE, MATERIALS-HANDLING

(See also makers of boom hoists)

American Hoist & Derrick Co., 63 S. Cedar St., St. Paul, Minn.

Brown-Fayro Co., 940 Ash St., Johnstown, Pa. (ADV., pg 144)

Chicago Pneumatic Tool Co., 6 E. 44th St., New York 17, N. Y. (ADV., pg 209)

Clyde Iron Works, Duluth, Minn.

Coffing Hoist Co., Danville, Ill.

Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

Yale & Towne Mfg. Co., Roosevelt Blvd., Philadelphia 15, Pa.

Instruments, Indicating & Recording

Bristol Co., 68 Bridge St., Waterbury 91, Conn.

Brown Instrument Div., Minneapolis-Honeywell Regulator Co., 4539 Wayne Ave., Philadelphia 40, Pa.

Fischer & Porter Co., Hatboro, Pa.

Foxboro Co., 94 Neponset Ave., Foxboro, Mass.

Leeds & Northrup Co., 444 N. 16th St., Philadelphia 30, Pa.

Laboratory, Quality-Control Equipment

(See also Sampling, Sample Preparation)

Burrell Corp., 2223 Fifth Ave., Pittsburgh 19, Pa.

Central Scientific Co., 1700 Irving Park Rd., Chicago, Ill.

Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Pa.

Western Machinery Co., 760 Folsom St., San Francisco 7, Calif. (ADV., pg 79)

Larries—See Refuse-Disposal

Layer-Loading Hoists—See Hoists, Layer Loading

Lighting & Floodlighting

Benjamin Electric Mfg. Co., Seegers Rd. & Northwest Hwy., Des Plaines, Ill.

Crouse-Hinds Co., Wolf & 7th N. Sts., Syracuse, N. Y.

General Electric Co., Nela Park, Cleveland, Ohio

D. W. Onan & Sons, 2499 University Ave., S.E., Minneapolis, Minn.

Sylvania Electric Products, Inc., Lighting Div., 64 Boston St., Salem, Mass.

Westinghouse Electric Corp., Lamp Div., McArthur Ave., Bloomfield, N. J.

Lights, Picking

General Electric Co., Nela Park, Cleveland, Ohio

Westinghouse Electric Corp., Lamp Div., McArthur Ave., Bloomfield, N. J.

Linings, Chute, Tank, Conveyor

GLASS, METAL

American Brake Shoe Co., 230 Park Ave., New York 17, N. Y., and American Manganese Steel Div., 389 E. 14th St., Chicago Heights, Ill.

Iowa Mfg. Co., 916 16th St., N. E., Cedar Rapids, Iowa.

Pittsburgh Plate Glass Co., 2200 Grant Bldg., Pittsburgh 19, Pa.

Stoody Co., Whittier, Calif.

Stulz-Sickles Co., 134 Lafayette St., Newark 5, N. J.

Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

Webster Mfg. Co., Tiffin, Ohio

RUBBER & SYNTHETICS

American Rubber Mfg. Co., 1145 Park Ave., Oakland 8, Calif.

Boston Woven Hose & Rubber Co., Box 1071, Boston 3, Mass.

Carlyle Rubber Co., Inc., 62 Park Pl., New York 7, N. Y.

Goodall Rubber Co., 403 Whitehead Rd., Trenton 4, N. J.

B. F. Goodrich Co., Akron 18, Ohio (ADV., pg 1, 211)

Goodyear Tire & Rubber Co., 1144 E. Market St., Akron 16, Ohio

Hewitt-Robins, Inc., Hewitt Rubber Div., 240 Kensington Ave., Buffalo 5, N. Y. (ADV., pg 18-19)

Linatex Corp. of America, Rockville, Conn.

Pioneer Rubber Mills, 353 Sacramento St., San Francisco 11, Calif.

Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N. J. (ADV., pg 113)

Republic Rubber Div., Lee Tire & Rubber Co., Youngstown 1, Ohio

Thermoid Co., Trenton, N. J. (ADV., pg 199)

United States Rubber Co., 1230 Ave. of the Americas, New York 20, N. Y. (ADV., Third Cover)

Continued on pg 100



at the
TIPPLE
Shaker Screens
Blending Feeders
Vibrating Screens
Coal Washers
Conveyors
Elevators
Screen Plates
Structures
Loading Booms
Picking Tables
Loading Chutes
Car Retarders

. . . at the
HEAD HOUSE
Mine Cars
Car Hauls
Trip Feeders
Hillside Conveyors
Rotary Car Dumps
Weigh Baskets
Storage Bins
Structures
Incline Drums
Monitors
Sand Driers
Slate Dumps

KANAWHA'S COAL PREPARATION GUIDE

CONSISTING OF—

Careful Planning, Advanced Engineering, Modern Equipment and Good Construction. These features have been combined to produce modern and efficient coal cleaning plants and coal handling methods for Kanawha's many satisfied customers during the last half century.

KANAWHA
MANUFACTURING COMPANY
CHARLESTON, W.VA. · · · BLUEFIELD, W.VA.

Complete Preparation Equipment • Engineering Service

A HELPING HAND





DIESEL FUELS and GASOLINES

Ashland Oil has been supplying the big eastern-central coal mining areas with quality fuels for the past quarter century. Ashland diesel fuels are carefully refined to meet the special requirements of heavy mining equipment. Our gasolines are catalytic refined and "season-right" to start quickly and operate most efficiently in any weather. Supplies are readily available through nearby terminals.

TO THE FINAL TOUCH

Ashland PERMA

COAL SPRAY

Progressive mines today include oil-treating as a necessary final touch to coal preparation. As the largest supplier of treating oils for the coal industry, Ashland engineers have made a thorough study of every treating problem.

PERMATREAT coal spray is available in grades and specifications to efficiently dust-proof and freeze-proof every type of coal. While this is the primary use, it also provides a better, more acceptable coal for both industrial and home use. It improves the appearance and makes coals easier to handle, easier to sell.

Many industrial and metallurgical plants are requesting PERMATREATed coals. They're more resistant to weather and degradation in the stockpile, better for coking charges. Water runs off and doesn't penetrate the stock pile.

For complete information on Ashland petroleum products for the mining industry, phone for an Ashland representative.

ASHLAND OIL & REFINING COMPANY
ASHLAND, KENTUCKY

ALL THE WAY...



NEW SUPER HD OIL KEEPS ENGINES CLEAN

This new Ashland TOPFLITE oil contains special detergents that reduce sludge, minimize carbon and keep engines running efficiently under the most grueling conditions. It is especially effective in diesel and gasoline motors that are subject to day after day of intermittent operation experienced in strip coal mining.

TESTED and PROVEN LUBRICANTS

Ashland Oil's many years experience supplying the coal mining industry enables us to provide the right lubricants for every mining operation. Our lubrication specialists will gladly advise and recommend the right greases for every job



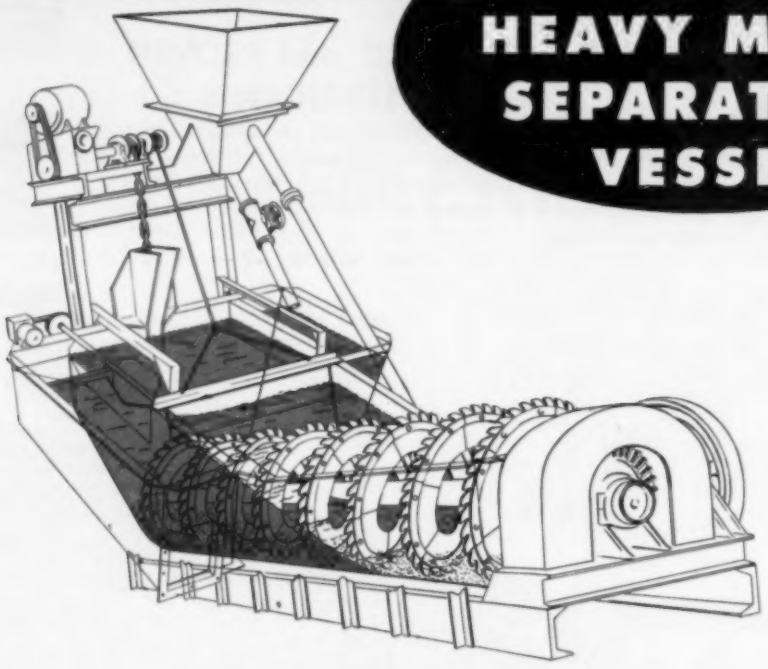


...

TREAT

PROVED ADVANTAGES OF

AKINS HEAVY MEDIA SEPARATORY VESSEL



NO INTERFERENCE OF PRODUCT DISCHARGE

In the Akins Vessel each product has its own separate zone to report, and these zones are widely separated. The sink material is raked in a submerged condition out of the pool at the elevated end. The float material is discharged at a point many feet from the sink area. There is no elevation of the sink material through the float zone, and of course, the chances of float material reporting with the sink material are minimized.

Other Outstanding Advantages of Akins

Entire vessel is visible and accessible.

Variation in feed rate or grade of feed is not detrimental.

Large pool area and volume facilitate better recovery of values from fine sizes.

Circulation of media at lower gravity and viscosity.

Gradation of gravity and viscosity from feed entry point to sink removal point provides natural cleaning of sink.

Three product separation in one machine.

Akins—the ORIGINAL spiral type classifier.

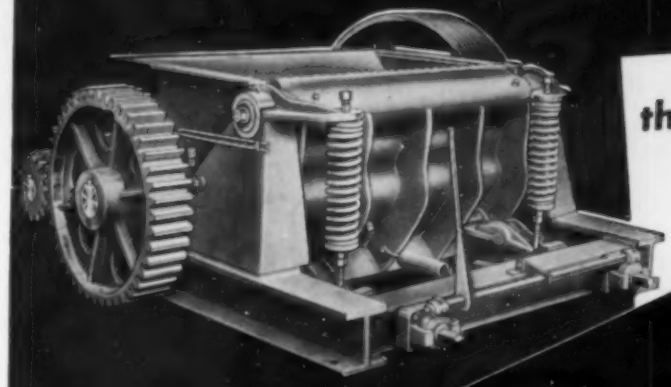
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Sales Agents and Licensed Manufacturers in Foreign Countries

A SUBSIDIARY OF THE MINE & SMELTER SUPPLY CO.



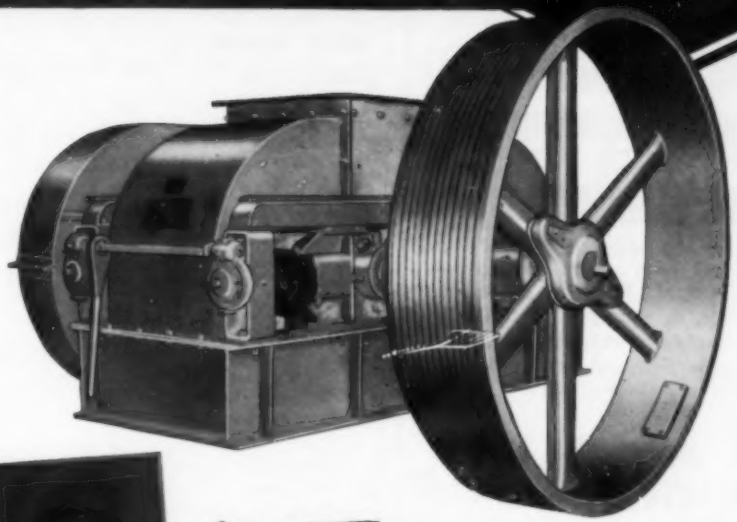
Crush Coal to Desired Size...
TO MEET ALL MARKET DEMANDS

the EFFICIENT ECONOMICAL and PRACTICAL WAY

McLANAHAN

Single and Double Roll

BLACK DIAMOND CRUSHERS



Used extensively throughout the anthracite and bituminous coal fields, these dependable McLanahan Black Diamond Crushers crack large or small lumps of coal or other materials to desired size with a minimum of fines. These machines are the answer to your coal crushing problems, and are built to handle high tonnages. Available in numerous sizes and types, these single and double roll crushers are constructed of steel, semi-steel, or fabricated steel, with babbitt or bronze bearings for a long life of satisfactory service.



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for Bulletin
BD-457

McLANAHAN & STONE CORPORATION
Pit, Mine and Quarry Equipment Headquarters Since 1835
Hollidaysburg, Pennsylvania

Dependable Products: Single and Double Roll—and Jaw Crushers, Crushing Plants, Reciprocating Plate and Apron Feeders, Roll Grizzlies, Conveyors, Elevators, Screens, Scrubbers, Steel Log Washers, Sand Drags, Hoists, Jigs, Dry Pans, Dryers, Scrap Bundlers, Pulleys, Gears, Bearings, Sprockets, Sheaves, Rollers, Bin Gates, Elevator Buckets, Gratings, Car Wheels, Ferrous and Bronze Castings.

ON THE WEIGH!

TO GREATER EFFICIENCY

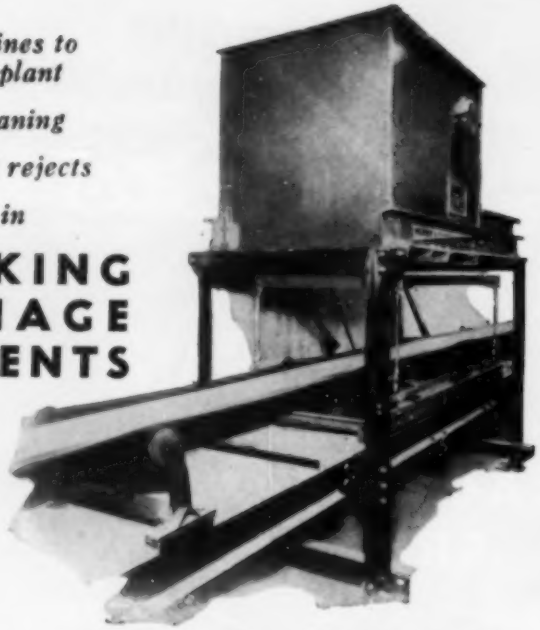
1 *From mines to washing plant*

2 *After cleaning*

3 *weighing rejects*

and in

CHECKING TONNAGE PAYMENTS



Modern Coal Handlers Need the

WEIGHTOMETER

Yes! All these features can be yours with a Merrick WEIGHTOMETER*—Accurate weight records mean lower production costs—Leading coal producers use the WEIGHTOMETER for continuous weighing while conveying—No interruption to conveyor service—Applicable to existing belt conveyors or furnished complete with short belt conveyor—Instruments for remote recording and permanent production records available—Write today for Bulletin 375 for further details.

• AND THERE'S ALSO THE FEEDOWEIGHT

The FEEDOWEIGHT* provides absolute control in the blending and proportioning of coal——Widely used in coking plants for accurate blending of coking coals by weight—Write for Bulletin 551 for further details.

*** Reg. U.S. Pat. Off.**

MERRICK SCALE MFG. CO.

173 Summer St., PASSAIC, NEW JERSEY

Loading Equipment

(See also, Chutes, Gates)

BOOMS, DIVERSION CHUTES

C. S. Card Iron Works Co., 2501 W. 16th Ave., Denver 1, Colo.

Continental Gin Co., 4500 Fifth Ave., S., Birmingham, Ala. (ADV., pg 129)

Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

Helmick Foundry-Machine Co., Fairmont, W. Va.

Hewitt-Robins, Inc., Robins Conveyors Div., 270 Passaic Ave., Passaic, N. J. (ADV., pg 18-19)

Heyl & Patterson, Inc., 55 Ft. Pitt Blvd., Pittsburgh 22, Pa. (ADV., pg 86-87)

Robt. Holmes & Bros., Inc., 520 Junction Ave., Danville 1, Ill. (ADV., pg 85)

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Kanawha Mfg. Co., Box 1786, Charleston, W. Va. (ADV., pg 95)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Lippman Engineering Works, 4603 W. Mitchell St., Milwaukee 14, Wis.

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Roberts & Schaefer Co., 130 N. Wells St., Chicago 6, Ill. (ADV., pg 112)

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Webster Mfg. Co., Tiffin, Ohio

Car Retarders—See Retarders, Car

Layer-Loading Hoists—See Hoists, Layer-Loading

RIVER PLANTS

Dravo Corp., Dravo Bldg., Pittsburgh 22, Pa.

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Kanawha Mfg. Co., Box 1786, Charleston, W. Va. (ADV., pg 95)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

K. Prins & Associates, Wellston, Ohio

Roberts & Schaefer Co., 130 N. Wells St., Chicago 6, Ill. (ADV., pg 112)

Lubricants

American Oil Co., American Bldg., Baltimore, Md. (ADV., pg 105)

Ashland Oil & Refining Co., 1409 Winchester Ave., Ashland, Ky. (ADV., pg 96-97)

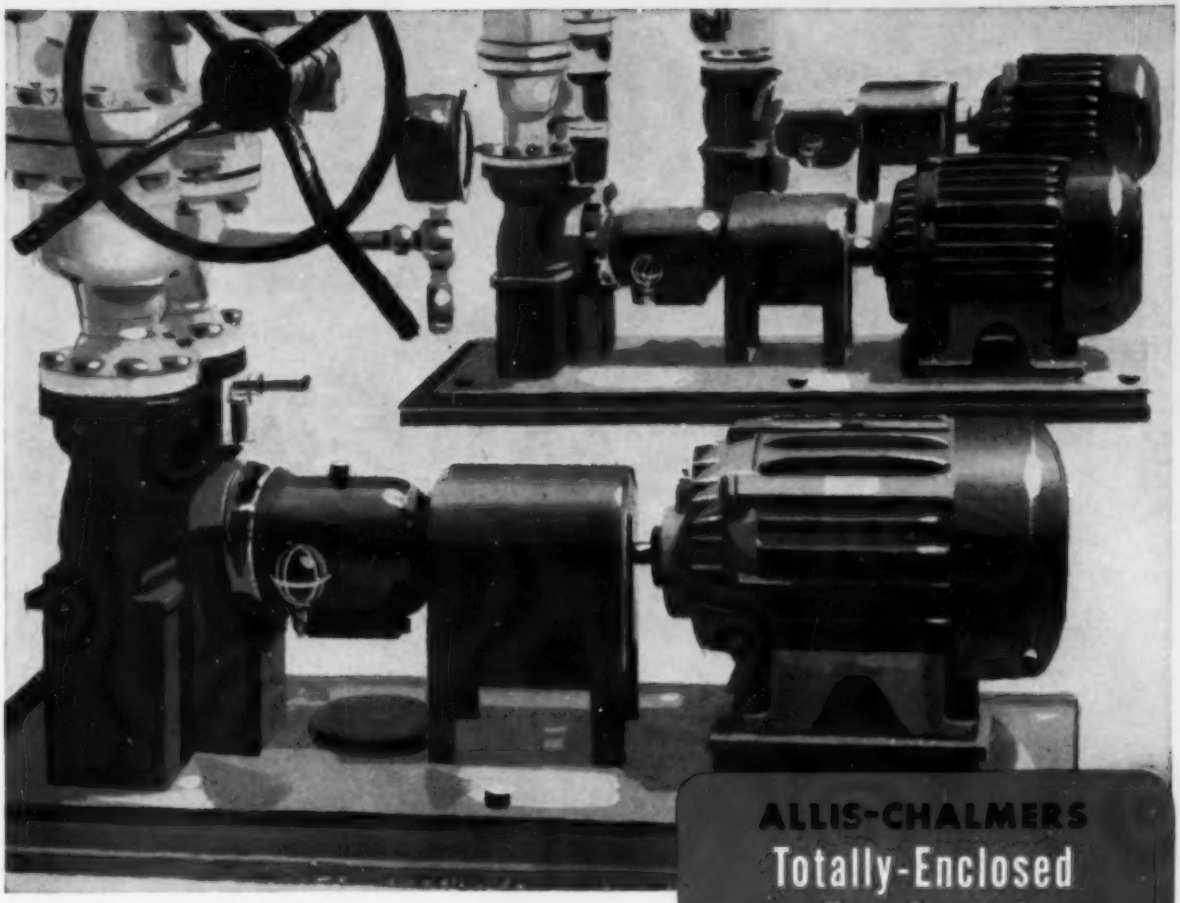
Atlantic Refining Co., 260 S. Broad St., Philadelphia, Pa.

Brooks Oil Co., 934 Ridge Ave., Pittsburgh 12, Pa. (ADV., pg 121)

Cities Service Oil Co., 60 Wall Tower, New York 4, N. Y. (ADV., pg 124)

D-A Lubricant Co., Inc., Indianapolis 23, Ind.

Fiske Bros. Refining Co., Lubriplate Div., 129 Lockwood St., Newark 5, N. J. (ADV., pg 132)



ALLIS-CHALMERS
Totally-Enclosed Fan-Cooled MOTORS

Greater Protection Against Foreign Matter
Long-Life Bearings
Many Tried and Proven Features

new motors new values

For especially dirty, corrosive or hazardous applications, you will get top performance with low maintenance costs from the new Allis-Chalmers totally-enclosed, fan-cooled and explosion-proof motors in NEMA rerate sizes. Here are a few of the reasons why.

- *Foreign matter kept out of bearings and motor interior by double labyrinth seals inside and outside of bearings, and long running fits between shaft and seals.*
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- *Easy to clean — no inaccessible air passages.*
- *Dirt wipes or blows off easily.*

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- ☐ Explosion-Proof, Type GZZ, 5187286

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ALLIS-CHALMERS

VICTAULIC
METHOD OF PIPING

FOR GROOVED PIPE



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VICTAULIC SNAP-JOINT

New, boltless coupling — hand-locks — for faster hook-ups with no loose parts. Ideal for temporary or permanent lines. Sizes 1", 1¼", 2", 3", 4".

Style 77 & 77-D



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EASIEST WAY TO MAKE ENDS MEET!

Lubricants (Cont'd)

Gulf Oil Corp., Gulf Bldg., Pittsburgh, Pa.

Hulburt Oil & Grease Co., Trenton & Castor Aves., Philadelphia, Pa. (ADV., pg 2, 3)

Pure Oil Co., 35 E. Wacker Dr., Chicago 1, Ill.

Sahara Oil Co., DuQuoin, Ill.

Shell Oil Co., 50 W. 50th St., New York 20, N. Y.

Sinclair Refining Co., 600 Fifth Ave., New York 20, N. Y. (ADV., pg 127)

Socony-Vacuum Oil Co., 26 Broadway, New York 4, N. Y.

Standard Oil Co. of California, 225 Bush St., San Francisco 4, Calif.

Standard Oil Co. (Ind.), 910 S. Michigan Ave., Chicago 80, Ill. (ADV., pg 138)

Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa. (ADV., pg 228)

Texas Co., 135 W. 42nd St., New York 17, N. Y. (ADV., pg 6-7)

Tide Water Associated Oil Co., 17 Battery Place, New York 4, N. Y.

Whitmore Mfg. Co., Iron Ct. & Erie R.R., Cleveland, Ohio (ADV., pg 135)

Lubricating Equipment

Alemite Div., Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago 14, Ill. (ADV., pg 141)

Farval Corp., 3249 E. 80th St., Cleveland 4, Ohio

Gray Co., Inc., 60 11th Ave., N. E., Minneapolis, Minn.

Lincoln Engineering Co., 5729 Natural Bridge Ave., St. Louis 20, Mo. (ADV., pg 205)

C. A. Norgren Co., 3400 S. Elati St., Englewood, Colo.

Trabon Engineering Co., Kelly Ave. & E. 40th St., Cleveland 3, Ohio

Magnetite Recovery

DENSIFIERS

Colorado Iron Works Co., 1620 17th St., Denver 2, Colo. (ADV., pg 98)

Western Machinery Co., 760 Folsom St., San Francisco 7, Calif. (ADV., pg 79)

MAGNETIC SEPARATORS

Dings Magnetic Separator Co., 4720 W. Electric Ave., Milwaukee 46, Wis. (ADV., pg 159)

Homer Mfg. Co., Lima, Ohio (ADV., pg 140)

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Stearns Magnetic, Inc., 631 S. 28th St., Milwaukee 46, Wis. (ADV., pg 131)

Magnets—See Tramp-Iron Removal

Motors—See Electrical Equipment

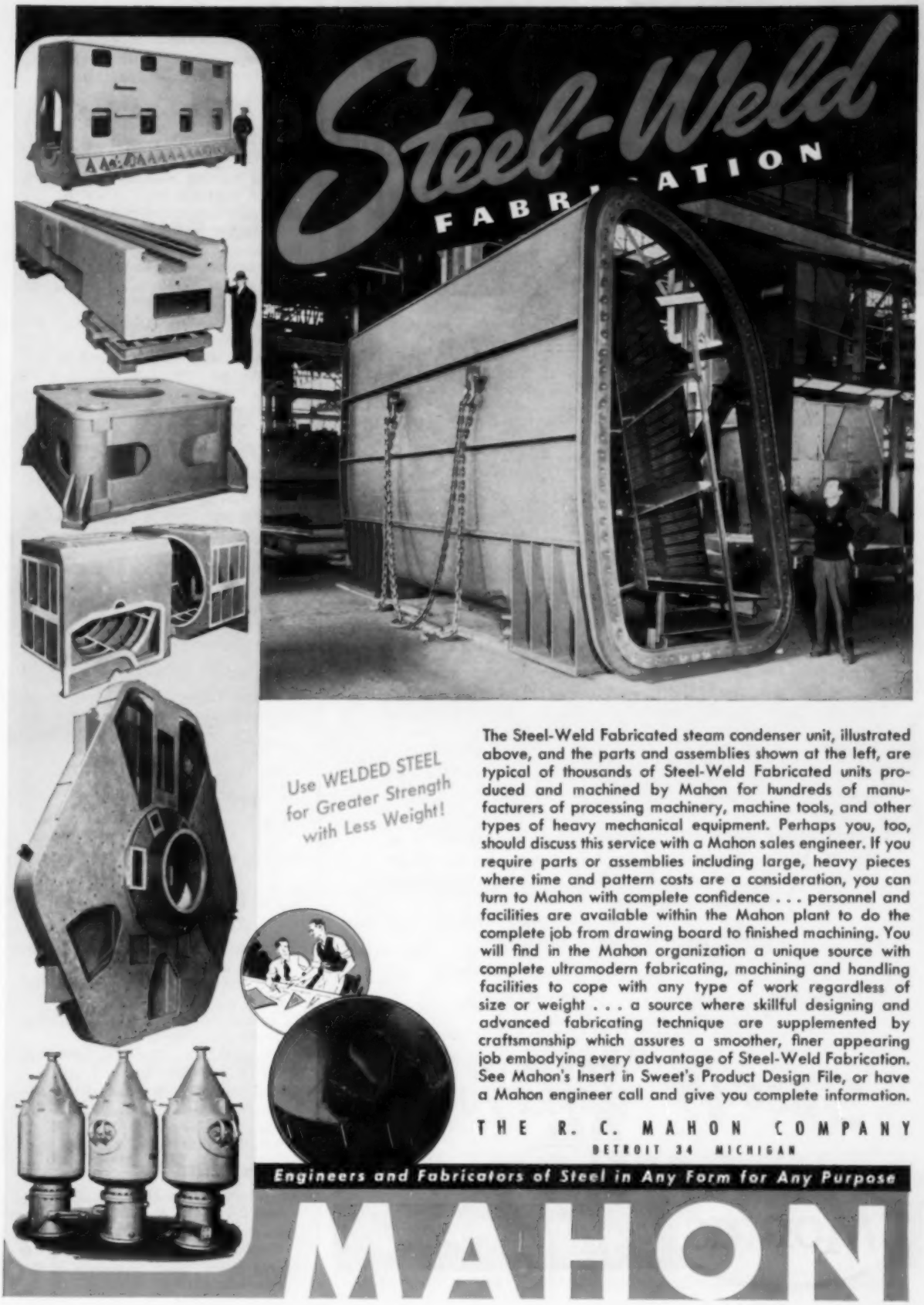
Nozzles—See Spray Nozzles

Oils, Dustproofing—See Dustproofing

Paints, Rust-Preventive

Insul-Mastic Corp. of America, 1141 Oliver Bldg., Pittsburgh 22, Pa.

Master Bronze Powder Co., 5009 Calumet Ave., Hammond, Ind.



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The Steel-Weld Fabricated steam condenser unit, illustrated above, and the parts and assemblies shown at the left, are typical of thousands of Steel-Weld Fabricated units produced and machined by Mahon for hundreds of manufacturers of processing machinery, machine tools, and other types of heavy mechanical equipment. Perhaps you, too, should discuss this service with a Mahon sales engineer. If you require parts or assemblies including large, heavy pieces where time and pattern costs are a consideration, you can turn to Mahon with complete confidence . . . personnel and facilities are available within the Mahon plant to do the complete job from drawing board to finished machining. You will find in the Mahon organization a unique source with complete ultramodern fabricating, machining and handling facilities to cope with any type of work regardless of size or weight . . . a source where skillful designing and advanced fabricating technique are supplemented by craftsmanship which assures a smoother, finer appearing job embodying every advantage of Steel-Weld Fabrication. See Mahon's Insert in Sweet's Product Design File, or have a Mahon engineer call and give you complete information.

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Stuffing Box Maintenance...

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Paints, Anti-Rust (Cont'd)

Royston Laboratories, Blawnox, Pa.

Rust-Oleum Corp., 2461 Oakton St., Evanston, Ill. (ADV., pg 111)

Picking Tables

Barber-Greene Co., Aurora, Ill. (ADV., pg 126)

Bonded Scale & Machine Co., 2176 S. Third St., Columbus 7, Ohio

Chain Belt Co., 4786 W. Greenfield Ave., Milwaukee 1, Wis. (ADV., pg 247)

Continental Gin Co., 4500 Fifth Ave., S., Birmingham, Ala. (ADV., pg 129)

Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

Helmick Foundry-Machine Co., Fairmont, W. Va.

Hendrick Mfg. Co., Carbondale, Pa. (ADV., pg 155)

Heyl & Patterson, Inc., 35 Ft. Pitt Blvd., Pittsburgh 22, Pa. (ADV., pg 86-87)

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Kanawha Mfg. Co., Box 1786, Charleston, W. Va. (ADV., pg 95)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McNally Pittsburgh Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Simplicity Engineering Co., Durand, Mich.

Stevens-Adamson Mfg. Co., 25 Ridgeway, Aurora, Ill.

Webster Mfg. Co., Tiffin, Ohio

Wilmot Engineering Co., Markle Bank Bldg., Hazleton, Pa. (ADV., pg 91)

Pillow Blocks—See Power Transmission

Pipe

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CAST IRON, WROUGHT IRON

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Pipe (Cont'd)

PLASTIC

Carlon Products Corp., 10221 Meech Ave., Cleveland 5, Ohio (ADV., pg 156)

Franklin Plastics Co., 315 Grant St., Franklin, Pa.

H. N. Hartwell & Sons, Park Sq. Bldg., Boston, Mass.

Johnson Plastic Corp., 201 Brown Rd., Chagrin Falls, Ohio

Elmer E. Mills Corp., 2930 N. Ashland Ave., Chicago, Ill.

Plastex Pipe & Extrusion Co., 402 Mt. Vernon Ave., Columbus 3, Ohio

Republic Steel Corp., Republic Bldg., Cleveland, Ohio

Triangle Conduit & Cable Co., New Brunswick, N. J.

United States Rubber Co., 1230 Ave. of the Americas, New York 20, N. Y. (ADV., Third Cover)

Yardley Plastics Co., 142 Parsons Ave., Columbus 15, Ohio

Youngstown Sheet & Tube Co., Stambaugh Bldg., Youngstown, Ohio (ADV., insert fol. pg 108)

RUBBER

American Hard Rubber Co., 93 Worth St., New York 18, N. Y.

Goodall Rubber Co., 430 Whitehead Rd., Trenton 4, N. J.

B. F. Goodrich Co., Akron 18, Ohio (ADV., pg 1, 211)

Goodyear Tire & Rubber Co., 1144 E. Market St., Akron 16, Ohio

Raybestos-Manhattan, Inc., Passaic, N. J. (ADV., pg 113)

United States Rubber Co., 1230 Ave. of the Americas, New York 20, N. Y. (ADV., Third Cover)

STEEL

(*•Indicates spiral wound*)

Albert Pipe Supply Co., Inc., Berry at N. 13th St., Brooklyn 11, N. Y.

Armco Drainage & Metal Products, Inc., 704 Curtis St., Middletown, Ohio (ADV., pg 248)

Bethlehem Steel Co., Bethlehem, Pa. (ADV., pg 20, 36, 44)

A. M. Byers Co., Clark Bldg., Pittsburgh 22, Pa.

James B. Clow & Sons, Inc., 201 N. Talman Ave., Chicago, Ill.

Colorado Fuel & Iron Corp., Continental Oil Bldg., Denver 1, Colo. (ADV., insert fol. pg 36)

L. B. Foster Co., Box 1647, Pittsburgh 30, Pa.

Jones & Laughlin Steel Co., 3 Gateway Center, Pittsburgh, Pa.

National Supply Co., Spang-Chalfant Div., Grant Bldg., Pittsburgh, Pa.

National Tube Div., U.S. Steel Corp., Frick Bldg., Pittsburgh 30, Pa. (ADV., pg 77)

Continued on pg 114

FOR LONG-LIVED, HEAVY-DUTY CONVEYORS..

IT'S TIMKEN®...



One section of a 3000 ton-per-hour Hewitt-Robins conveyor system that's moving ore to a weigh station. To assure long life and trouble-free operation, the idlers are equipped with Timken tapered roller bearings.

AND TIMKEN AGAIN!



One of the world's longest 24" belt conveyors carries coal 1½ miles from mine tipple to power company. A Jeffrey belt conveyor, it handles 300 TPH of 2" x 0" coal. Timken bearings on the idlers reduce friction and belt wear.

AND TIMKEN...



Wood chips ride to pulp processing on this 42-inch conveyor. The Chain Belt idlers are mounted on Timken bearings to keep them running smoothly with minimum maintenance.

AND HERE ARE SIX BIG REASONS WHY:

1. **THOROUGHLY PROVED.** The Timken® bearing is the only tapered roller bearing proved by 15 years or more of service in heavy-duty conveyor installations using the popular dead shaft construction.

2. **EXTRA CAPACITY.** Line contact between rollers and races gives Timken bearings high load capacity. And by using Timken bearing sizes that are mass produced for the automotive industry, you get extra capacity bearings that actually cost you *less* than the smaller sizes you'd normally use.

3. **LONG-LIFE LUBRICATION.** Not just lubricated for "life", but lubricated yearly, or as conditions require, to insure *long* life. Fresh lubricant ends any chance of gummy, sticky, jammed bearings.

4. **LONGER ROLLER AND BELT LIFE.** Less sliding and scuffing between idlers and belt.

5. **FRICTION MINIMIZED.** Timken bearings' true rolling motion and extremely smooth surface finish practically eliminate friction.

6. **MAINTENANCE REDUCED.** Long life and dependable performance of Timken tapered roller bearings cut maintenance to a minimum.

Remember "Timken" is not a bearing type. It is a trademark applying to bearings made by The Timken Roller Bearing Company. Always insist on Timken bearings in the conveyors you build or buy. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

Wherever the going's tough industry turns to

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS





Typical application of Timken bearings for conveyor idlers.

NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⬮ AND THRUST →⬮← LOADS OR ANY COMBINATION

Cleaning up with SECO

BRUNS COAL COMPANY

BEVERLY, OHIO



PROGRESSIVE OPERATOR GETS 225 T.P.H. OF COAL IN MARKETABLE SIZES

Here is just one of the dependable Seco vibrating screens on the job for Bruns Coal Company. This 5′ x 16′ double deck type H Seco is a real workhorse when it comes to cleaning and sizing coal.

Hour after hour, month after month, 225 tons of R.O.M. hit this smooth operating Seco, and it doesn't faze it a bit, thanks to Seco's fully controlled true circular action.

The big lumps averaging 50 tons per hour are discharged off the top deck with 4″ opening, approximately 65 tons per hour of minus 4″ plus 1½″ are discharged off the bottom deck with 1½″ opening and approximately 110 tons per hour of minus 1½″ are delivered through the bottom deck.

Mr. Bruns is very well satisfied with the performance of his Seco vibrating screens.

How about your operation? Are you getting the better profits that clean, properly-sized coal can bring you? May we show you how a Seco can do this for you for pennies per ton? Write, wire or phone today!

SECO

TRUE CIRCULAR ACTION

VIBRATING SCREENS

Do you have your copy

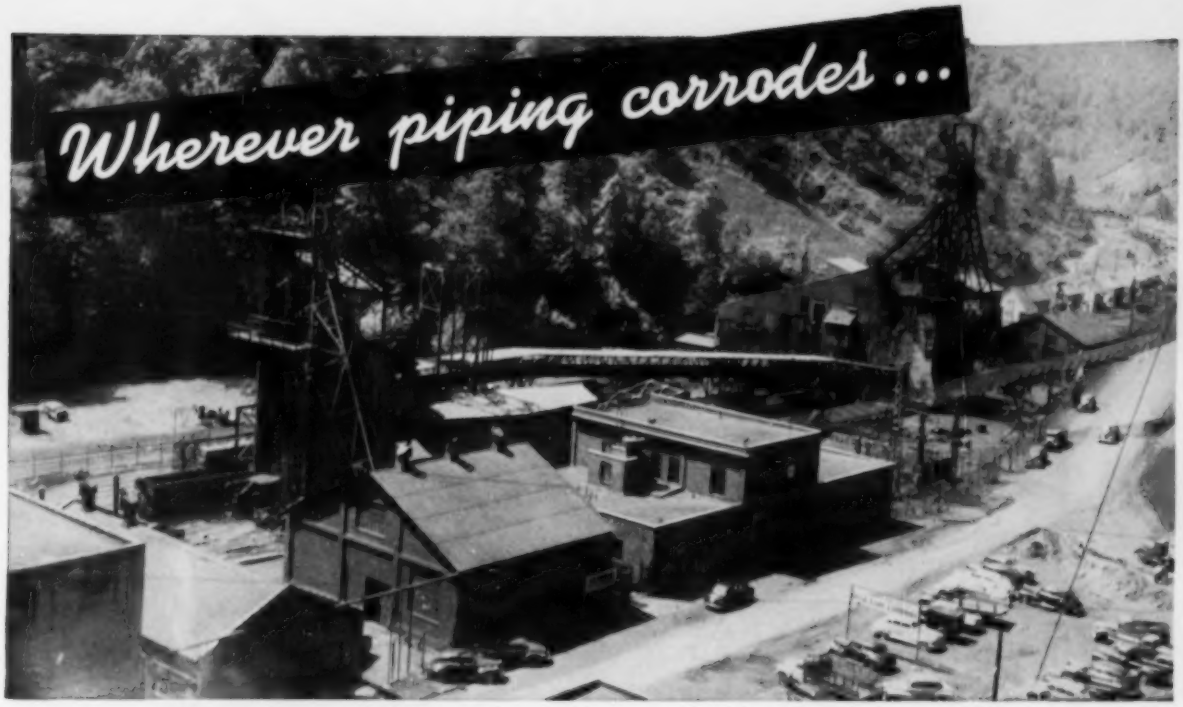


Seco Coal Bulletin No. 53

SCREEN EQUIPMENT CO., Inc.

1750 Walden Avenue

Buffalo 25, New York



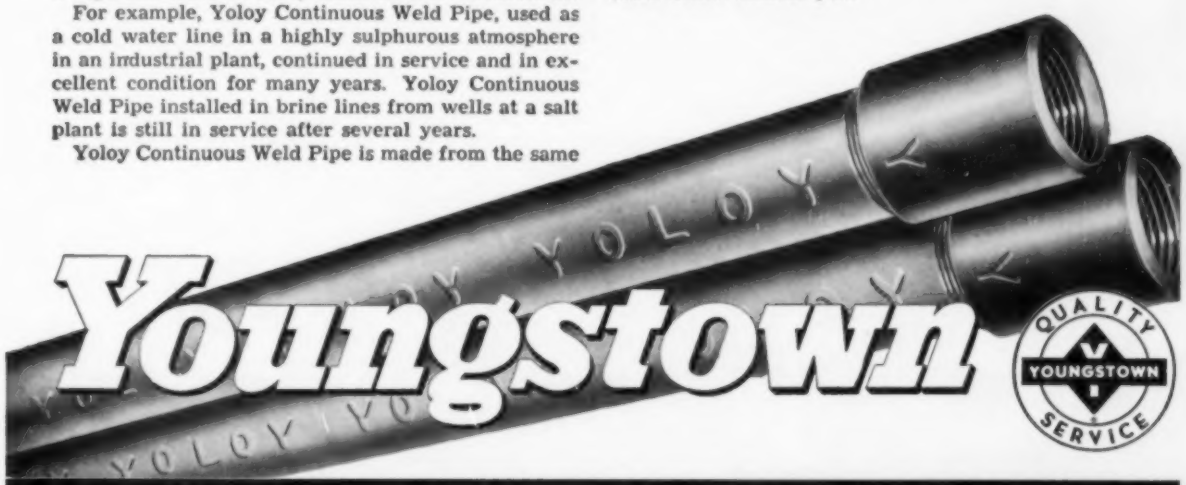
use YOLOY continuous weld pipe

Yoloy Continuous Weld Pipe offers distinct advantages for use in mines and industry where replacements due to corrosion are frequent. In addition, its use is recommended wherever piping is concealed—in commercial buildings, schools and residences.

In standard tests Yoloy steel has demonstrated that its resistance to atmospheric corrosion is four to six times greater than that of regular steels. In actual installations Yoloy Pipe has demonstrated that it has a high resistance to many other corrosive conditions.

For example, Yoloy Continuous Weld Pipe, used as a cold water line in a highly sulphurous atmosphere in an industrial plant, continued in service and in excellent condition for many years. Yoloy Continuous Weld Pipe installed in brine lines from wells at a salt plant is still in service after several years.

Yoloy Continuous Weld Pipe is made from the same nickel-copper steel composition that has proved so successful in service in the oil, mining, railroad, chemical, trucking and other industries where resistance to corrosion and abrasion is of prime importance. This pipe is easy to thread and fabricate with standard pipe tools. It can be electric or gas welded readily. It has high strength and high resistance to abrasion, shock and vibration fatigue. For further information, write or phone the Youngstown District Sales Office nearest you.



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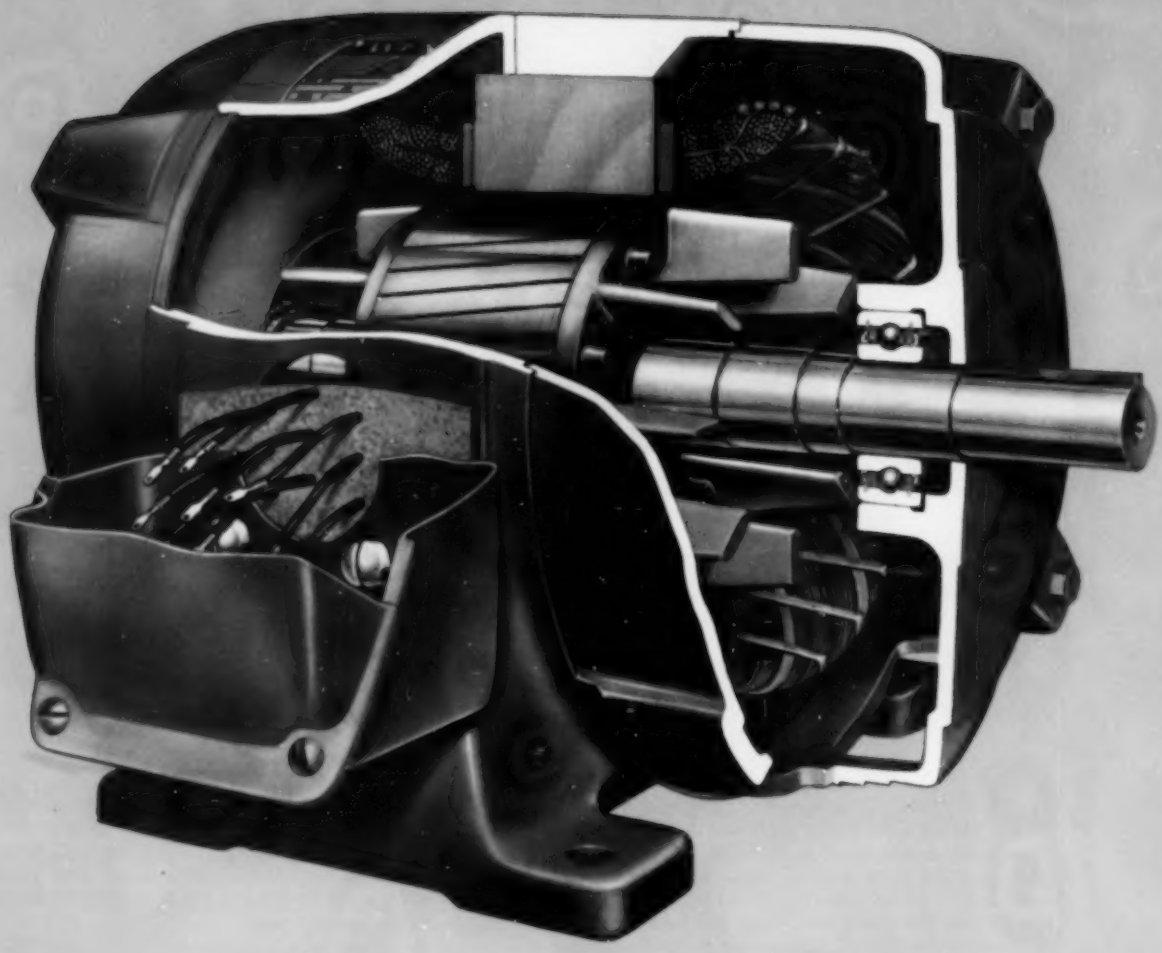
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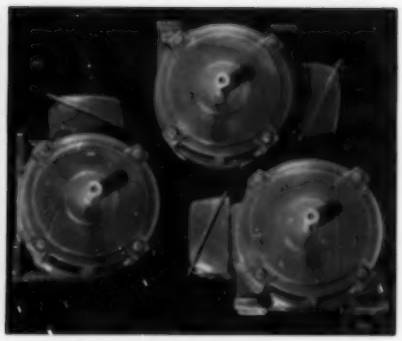


New 4-WAY SEAL, pre-lubricated bearing means lower maintenance costs. Another step ahead in bearing design. A SEALED, PRE-LUBRICATED bearing with *two* protective seals on *each side*. Stationary inner seals form labyrinth joints. Rotating outer seals act as flingers. This bearing has all the advantages of the original Life-Line sealed bearing—*plus extra protection.*



New FORTIFIED INSULATION means longer motor life. Another step ahead in motor insulation. MYLAR*, a new slot insulation with greater dielectric and mechanical strength. BONDAR, a new wire insulation with more heat resistance . . . longer life. BONDITE, a new stator insulation with greater strength to withstand attacks from destructive elements.

*Trademark for DuPont polyester film



New PROTECTED HOUSING means dripproof in any position. Another step ahead in motor protection. End-bracket openings are located in the underquadrant for maximum protection. Brackets can be rotated 90° or 180° for wall or ceiling mounting. Circumference of motor frame is *completely enclosed* so that it remains dripproof in *all* mounting positions.

The new Life-Line A motor
...the big step ahead by Westinghouse

Here it is . . . the new Life-Line® "A" motor. A new motor that steps ahead to lead the industry. A new motor that reflects the continuing engineering and manufacturing leadership of Westinghouse. A new motor that gives you . . .

Greater protection
Greater application flexibility
Smoother, quieter operation
Lower maintenance costs
Fewer motor outages
Longer motor life

The new Life-Line "A" motor is still a step ahead of the industry. How? Through balanced design and proved performance. Look at the improved materials and advanced mechanical and electrical components—each one matched to its neighbor.

New? Yes, but not untried. The new Life-Line does not discard the past . . . instead it profits by it and builds upon it. Each component of the new Life-Line has been screened in the laboratory, then proved on production-line motors. You're not buying "theoretical" performance. The new Life-Line motor, is a proved Life-Line. J-21846



GET THIS FREE BOOK

Here are all details on the new Life-Line "A" motor. Read about the new insulating materials—the new stator core—the new cooling methods—the new precision manufacturing techniques. Write for your free copy of Booklet B-6154. Westinghouse Electric Corporation, 3 Gateway Center, P.O. Box 868, Pittsburgh 30, Penna.

YOU CAN BE SURE...IF IT'S
Westinghouse



Why V-Belts with CONCAVE SIDES Last Longer!

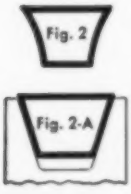
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Prove this yourself!



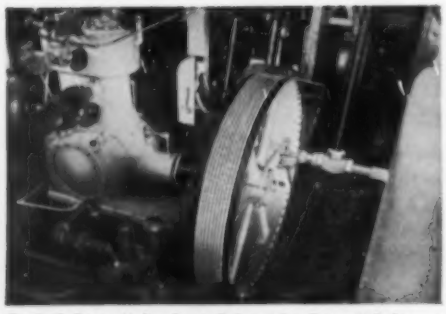
Take any *straight-sided* V-Belt (Fig. 1). Bend it—as it bends in going around a pulley. The sides will at once *bulge out* (Fig. 1-A). Clearly, those bulging sides will press *unevenly* against the V-pulley—and this causes *extra wear* at the points shown by the arrows (Fig. 1-A).

Now bend a Gates Vulco Rope with CONCAVE SIDES (Fig. 2)



Instead of *bulging*, the precisely engineered CONCAVE SIDES merely *fill out* to *fit exactly* in the sheave groove (Fig. 2-A). The sides press *evenly* against the V-pulley. All wear is distributed *uniformly* across the *full width* of the Gates Vulco Rope—and this means *longer* belt life and *lower belt costs* for you!

When you buy V-Belts, be sure to get the V-Belt with the CONCAVE Sides—the Gates Vulco Rope!



Typical Gates Vulco Rope Drive—the Gates V-Belts are built with Concave Sides to insure longer belt wear.

Gates VULCO ROPE DRIVES

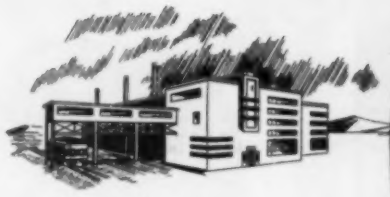
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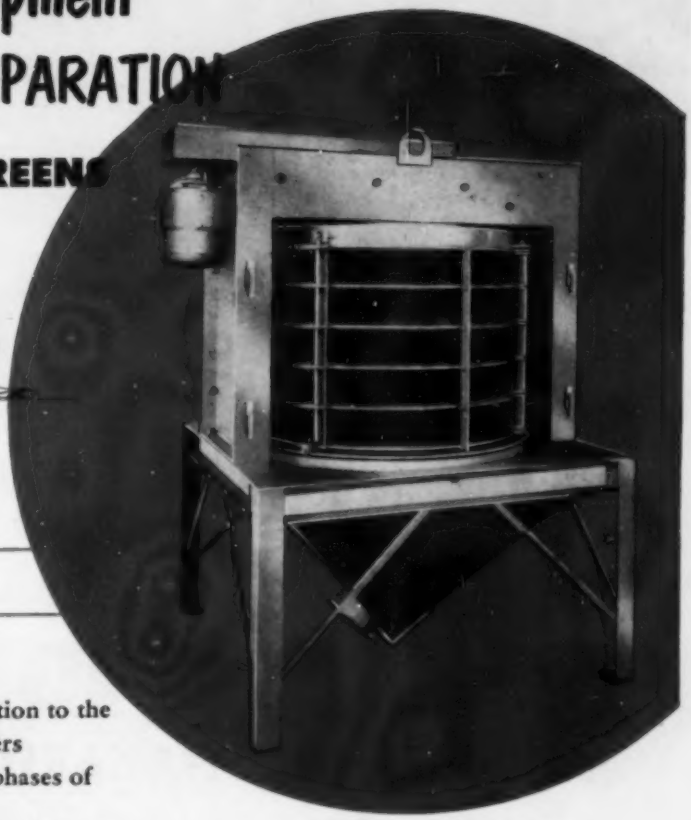
Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

THE GATES RUBBER COMPANY
DENVER, U.S.A.

A Proven New Development for BETTER COAL PREPARATION

. . . SYMONS "V" SCREENS





. . . for SIZING

. . . for DEDUSTING

. . . for DEWATERING

The Symons® "V" Screen, the newest addition to the well-known line of Symons screens . . . offers increased efficiency and economy in many phases of coal preparation service.

An entirely new screening principle gives the Symons "V" Screen unequalled high capacity for sharp, single cut, wet or dry separations, especially in the more difficult to screen finer sizes. The screening principle employs controlled diffused feed and vertical flow of material, with a low rotary speed and high speed gyratory action, combining centrifuge and gravitational force.

In dry screening, a natural fanning action carries the "air float" through with the undersize, making the handling of light weight materials extremely effective. In dewatering, the centrifugal action produces a much dryer product.

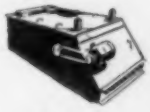
Requiring a minimum of floor space, the Symons "V" Screen is easily installed, and provides fully enclosed construction to assure dustless operation—yet access to the screen is simplified through easily removable covers. *Mail the coupon for further details.*

NORDBERG MFG. CO., Milwaukee, Wisconsin

OTHER SYMONS SCREENS



SYMONS HORIZONTAL SCREENS



SYMONS ROD DECK SCREENS



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SYMONS ROD GRIZZLIES

SYMONS . . . A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD.

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MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

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S353

MAIL THIS COUPON TODAY

NORDBERG MFG. CO., Milwaukee, Wisconsin CA
Please send me further information on the following screens for coal preparation service:

☐ Symons "V" Screens ☐ Symons Rod Deck Screens
☐ Symons Horizontal Screens ☐ Symons Grizzlies

Name ..... Title .....
Company .....
Address .....
City ..... Zone ..... State .....





*Top photo shows Face Conveyor in British coal mine. Inset shows roll of SCANDURA.

NEW SCANDURA
the original P.V.C. coated
CONVEYOR BELTING
eliminates big FIRE HAZARD in mining operations

One of the great hazards of mining—fire caused by a belt stalled over a still-rotating driving drum—is eliminated by new SCANDURA BELTING .... the original P.V.C. Coated Conveyor belt which was developed in the United Kingdom and now manufactured by us in our Charlotte, N. C. plant.

LET'S LOOK AT THE RECORD!

About 12% of coal mining fires in the past several years have been attributed to conveyor-belt friction.

At the 1953 annual meeting of the Illinois Mining Institute, data was presented to show that the majority of belt fires result from stalled belts while the idler pulley continues pulling.

In the tragic Evanston, Ky. fire in which 4 men lost their lives, fire was reported to have had its origin in the friction caused when a fall stopped the belt, while the drive motor continued to operate.

This record clearly points to the great need for SCANDURA BELTING!

Other unique SCANDURA features:

- *Withstands abrasions that would ruin other belts.*
- *Exceptionally tenacious in holding fasteners.*
- *Solid woven base with covers that will not strip, gouge or "dog ear".*
- *Not affected by water, dilute acids, alkalis, salt solutions, etc.*
- *Non-inflammable, mildew and rot-proof.*
- *Works in temperatures ranging from 22° below to 212° above.*
- *Can be made in widths from 1" to 42" and thicknesses from 1/8" to 3/8".*

SCANDURA has been tested and used with gratifying results in Britain since 1946. For safety and economy, it's in a class by itself. Write, wire or telephone for complete data.

SCANDINAVIA BELTING COMPANY
250 CENTRAL AVENUE, NEWARK 1, N. J.
BOSTON • PLANT: CHARLOTTE 1, N. C. • CLEVELAND

STOP RUST! with RUST-OLEUM

BEAUTIFY AS YOU PROTECT YOUR RUSTABLE METAL SURFACES

Save costly tipples, machinery, draglines, coal cars, pipes, etc., in underground or strip mine operations. *STOP RUST* with RUST-OLEUM . . . and beautify as you resist moisture, fumes, weathering and many chemicals. Apply *directly over sound rusted surfaces* after scraping and wirebrushing to remove rust scale and loose particles. Get the facts, now! Prompt delivery from Industrial Distributors in principal cities of the United States and Canada.

RUST-OLEUM CORPORATION
2463 Oakton Street • Evanston, Illinois

APPLY DIRECTLY OVER SOUND RUSTED SURFACES ®

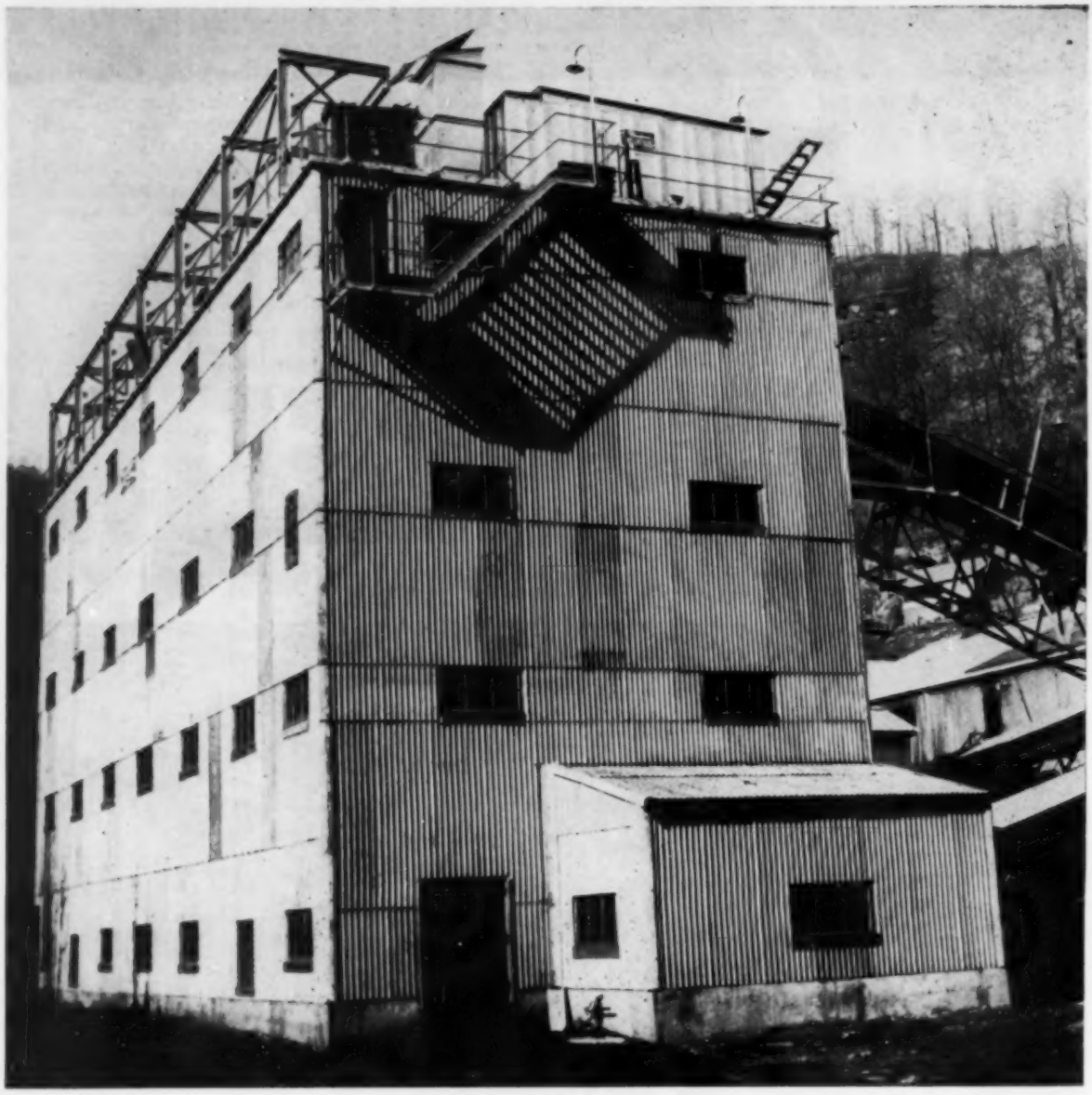


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See local classified telephone directory under Rust Preventives or Paints for nearest source of supply.

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MAIL TO: RUST-OLEUM CORPORATION
2463 Oakton Street • Evanston, Illinois

- ☐ Have a Qualified Representative Call
- ☐ Full Details on Free Survey
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- ☐ Nearest RUST-OLEUM Source



Keystone Preparation Plant—

ANOTHER MODERN NEW R&S AIR-WASHING PLANT

The Keystone Plant of Eastern Gas & Fuel Associates is another in the ever-growing list of preparation plants engineered, constructed and equipped by Roberts & Schaefer Co.

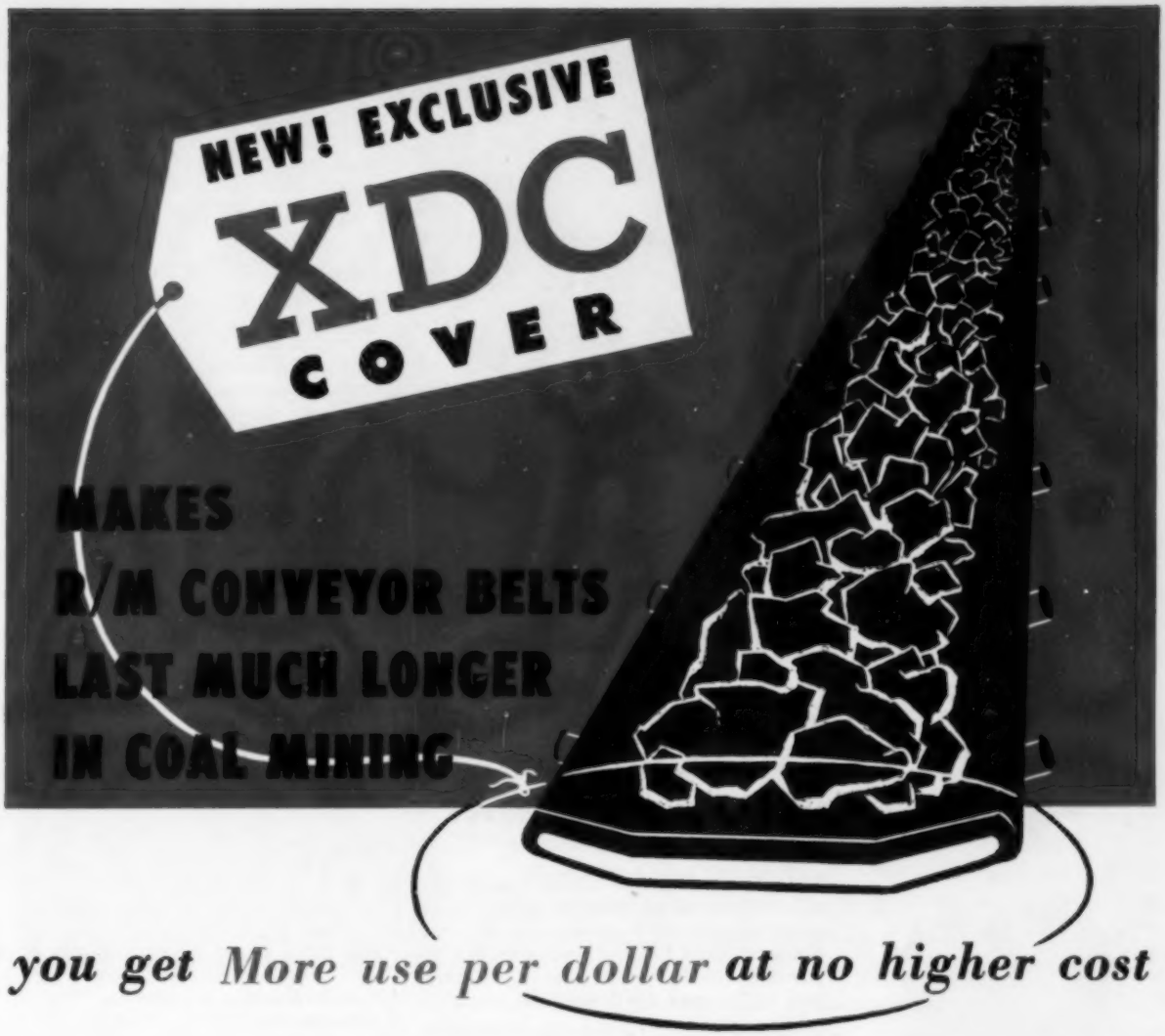
You, too, will find that Roberts & Schaefer Co. is a good name to remember when you want a one-source solution to *your* coal preparation problems.

ROBERTS & SCHAEFER CO.

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you get More use per dollar at no higher cost

Now, an amazing new conveyor belt cover compound developed by Raybestos-Manhattan provides phenomenal resistance to wear and tear. Most conveyor belt failures start with wear of the cover. "XDC" Cover greatly extends the life of R/M Conveyor Belts by giving protection never before attained against wear, abrasion, cuts and tears which lead to costly internal damage. The new "XDC" Cover greatly increases the benefits of Raybestos-Manhattan's other outstanding developments in conveyor belt design . . . Constructions like extra flexible RAY-MAN "F," extra-cushioned HOMO-CORD, HOMOFLEX and extra-high tension RAY-MAN. This major advance in rubber engineering puts longer life, "More Use per Dollar" into tough, dependable R/M Conveyor Belts. When you are thinking about conveyor belts, call an R/M representative.

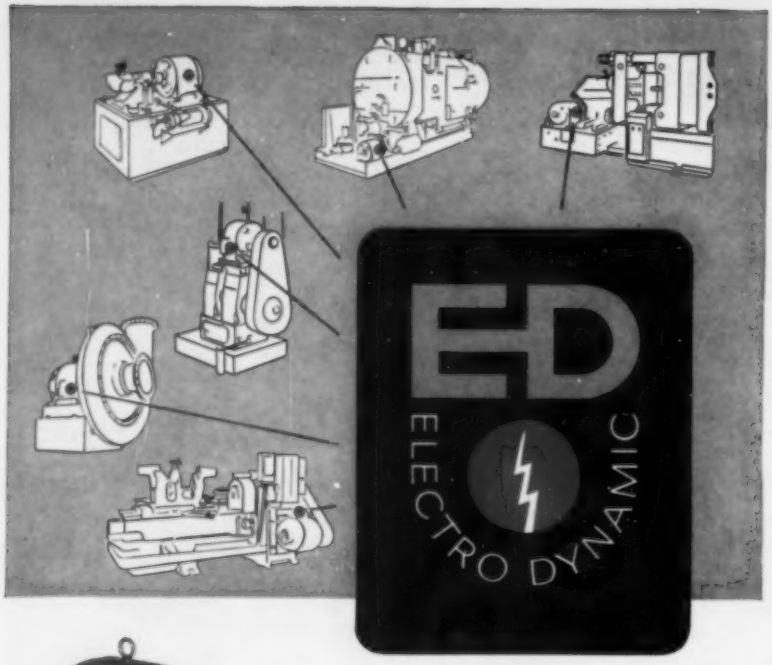
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MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
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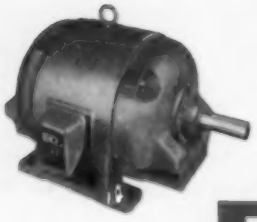


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The red *power spot* on industrial machinery means "Powered by Electro Dynamic." Such machinery relies with confidence on the *extra dependability* of Electro Dynamic motors, the proven industrial motors which give industrial equipment *extra dependable* operation.

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COMPANY_____

ADDRESS_____

Pipe, Steel (Cont'd)

*Naylor Pipe Co., 1243 E. 92d St., Chicago 19, Ill.

Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio (ADV., pg 223)

Youngstown Sheet & Tube Co., Youngstown, Ohio (ADV., insert fol. pg 108)

Plate, Sheet—See Screen Plate

Portable Preparation Plants

Bonded Scale & Machine Co., 2176 S. Third St., Columbus 7, Ohio

Eagle Crusher Co., Galion, Ohio

Iowa Mfg. Co., 916 N. 16th St., N. E. Cedar Rapids, Iowa

McLanahan & Stone Corp., Hollidaysburg, Pa. (ADV., pg 99)

Ridge Equipment Co., Fallentimber, Pa. (ADV., pg 126)

Western Machinery Co., 760 Folsom St., San Francisco 7, Calif. (ADV., pg 79)

Power Transmission

BEARINGS, ANTIFRICTION

Ahlberg Bearing Co., 3029 W. 47th St., Chicago 32, Ill.

Bearings, Inc., 3634 Euclid Ave., Cleveland 15, Ohio (ADV., pg 117)

Bower Roller Bearing Co., 3040 Hart Ave., Detroit 14, Mich.

Chain Belt Co., Shafer Bearings Div., 4786 W. Greenfield Ave., Milwaukee 1, Wis. (ADV., pg 247)

Fafnir Bearings Co., 37 Booth St., New Britain, Conn.

General Motors Corp., New Departure Div., Bristol, Conn.
Hyatt Bearings Div., Harrison, N. J.

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Marlin-Rockwell Corp., Jamestown, N. Y.

Norma-Hoffman Bearings Corp., Stamford, Conn.

Roller Bearings Co. of America, Trenton 3, N. J.

Rollway Bearing Co., 541 Seymour St., Syracuse 4, N. Y.

SKF Industries, Inc., Front St. & Erie Ave., Philadelphia 32, Pa. (ADV., pg 158)

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Timken Roller Bearing Co., Canton 6, Ohio (ADV., pg 107)

Tyson Bearings Co., Massillon, Ohio

BEARINGS, SLEEVE

American Crucible Products Co., 1301 Oberlin Ave., Lorain, Ohio

Flood City Brass & Electric Co., Messenger & Elder Sts., Johnstown, Pa. (ADV., pg 139)

General Electric Co., Chemical Div., 1 Plastics Ave., Pittsfield, Mass.

Keystone Carbon Co., 1933 State St., St. Marys, Pa.

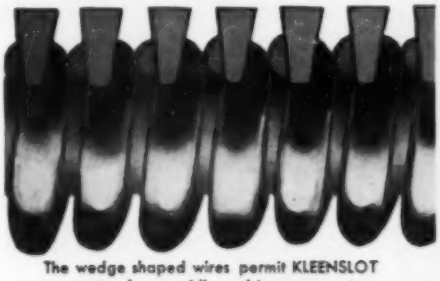
Wedge-Wire

REG. U. S. PAT. OFF.

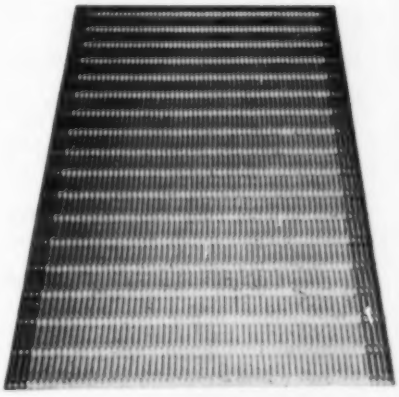
Kleenslot

PREPARATION, SIZING and DEWATERING SCREENS for THE MINING FIELD

The diagram above illustrates clearly and concisely the non-clogging and non-blinding advantages of Wedge-Wire preparation screens. All materials "clear" quickly, thus increasing efficiency in production.



The wedge shaped wires permit KLEENSLOT screens to clear rapidly and increase material output.



DESIGNED and PRODUCED TO YOUR SPECIFICATIONS

Wedge-Wire KLEENSLOT preparation screens were developed to provide high production at lowest cost per ton. We offer to the mining industry which has screening, dewatering, washing, drying, filtering or sizing problems, a high standard of efficiency and performance. In short, we offer efficient precision applications, coupled with long life. Greater design strength is obtained in even the smallest size by rigid cross-rods which tie the wires together, eliminating distortions of openings and giving maximum strength and support.

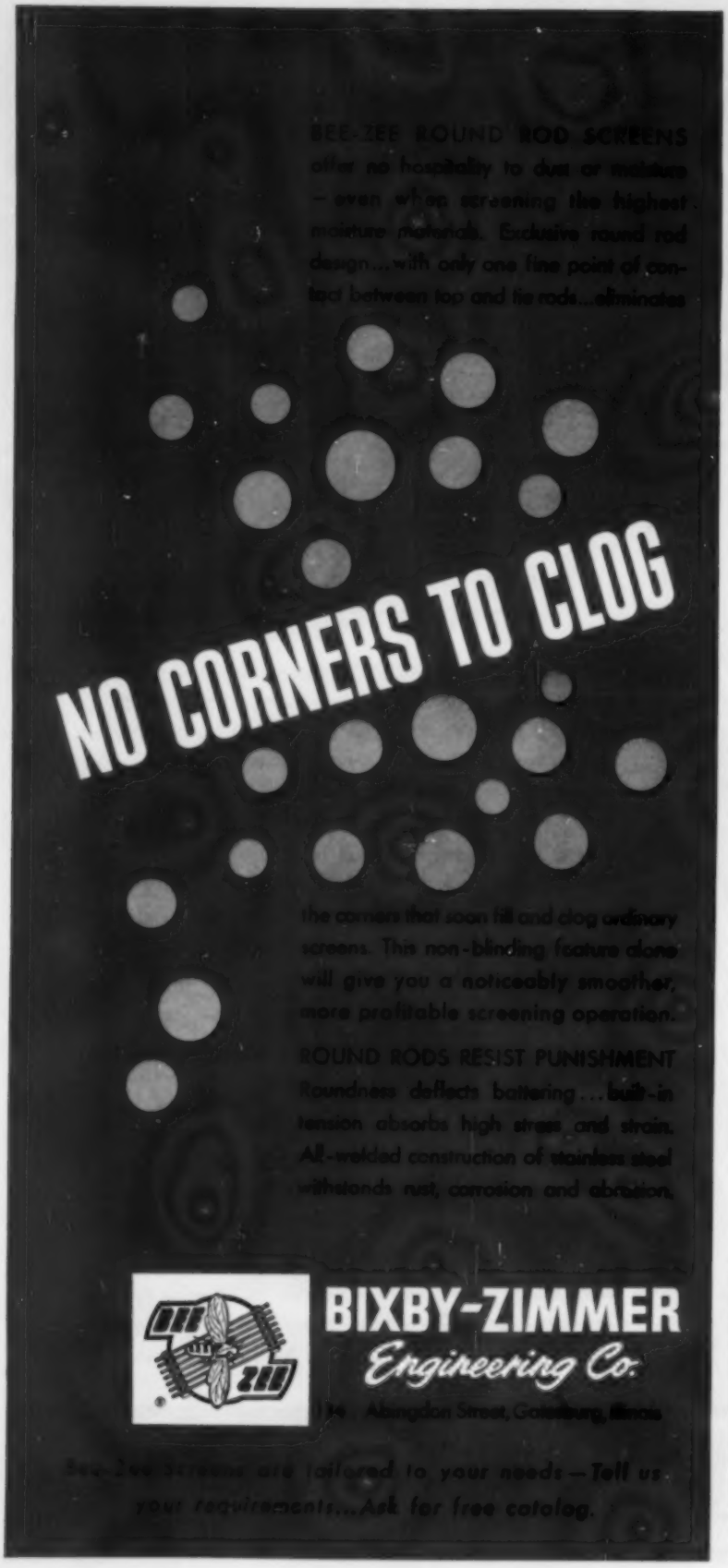
Only quality materials are used, including mild steel, stainless steel, bronze, brass, monel, copper, nickel, aluminum and silicon bronze.

All Wedge-Wire screens are manufactured to your specifications and be assured that our engineering staff will capably assist you promptly in obtaining the proper and correct solution to your preparation problems.

KLEENSLOT screens are made to fit any type of machine or installation. They may be curved to any shape or form, drums, troughs, etc.

Wedge-Wire CORPORATION

GAS ST. at NICKEL PLATE R.R. • WELLINGTON, OHIO



Bearings, Sleeve (Cont'd)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Penn Machine Co., 106 Station St., Johnstown, Pa.

CHAIN DRIVES

Chain Belt Co., Baldwin-Duckworth Div., 349 Plainfield St., Springfield, Mass. (ADV., pg 247)

Continental Gin Co., 4500 Fifth Ave., S., Birmingham, Ala. (ADV., pg 129)

Dodge Mfg. Corp., Mishawaka, Ind. (ADV., insert fol. pg 92)

Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Morse Chain Co., 7601 Central Ave., Detroit, Mich.

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Whitney Chain Co., 237 Hamilton Ave., Hartford 2, Conn.

COUPLINGS

Ajax Flexible Coupling Co., Westfield, N. J.

Chain Belt Co., 4786 W. Greenfield Ave., Milwaukee 1, Wis. (ADV., pg 247)

De Laval Steam Turbine Co., 300 Nottingham Way, Trenton 2, N. J.

Dodge Mfg. Corp., Mishawaka, Ind. (ADV., insert fol. pg 92)

Dynamatic Corp., 3307 14th Ave., Kenosha, Wis.

Falk Corp., 3001 W. Canal St., Milwaukee, Wis.

Farrel-Birmingham Co., 23 Main St., Ansonia, Conn.

Foote Bros. Gear & Machine Corp., 4545 S. Western Blvd., Chicago 9, Ill.

D. O. James Mfg. Co., 1114 W. Monroe St., Chicago, Ill.

W. A. Jones Foundry & Machine Co., 4463 Roosevelt Rd., Chicago 24, Ill.

Koppers Co., Fast's Coupling Dept., 690 Scott St., Baltimore 3, Md. (ADV., pg 246)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Lovejoy Flexible Coupling Co., 4949 W. Lake St., Chicago, Ill.

Medart Co., 100 Potomac St., St. Louis 18, Mo.

Morse Chain Co., 7601 Central Ave., Detroit 8, Mich.

Philadelphia Gear Works, G St. & Erie Ave., Philadelphia 34, Pa.

Smith Power Transmission Co., 1545 E. 23d St., Cleveland 14, Ohio

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Thomas Flexible Coupling Co., Warren, Pa.

Continued on Pg. 122



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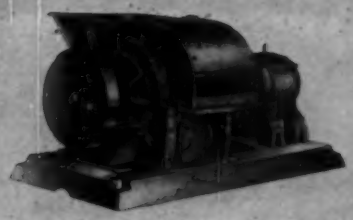
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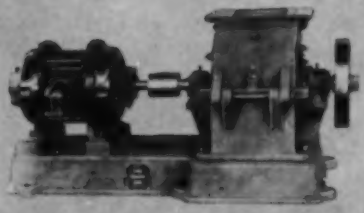


Heavy Duty 30-S. For Primary Crushing. Crushes ROM coal, rock, slate, sulphur balls and gob—high tonnage without oversize. Saves labor costs of pickers.

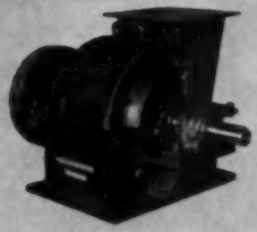


"S" Series. 9 sizes. Capacities up to 500 TPH. High tonnage with minimum fines. Well suited to power plants.

OR COAL SAMPLING . . .



Laboratory Mill. 2 sizes. Capacities up to 2000 lbs./hr. Very efficient for coal sampling.

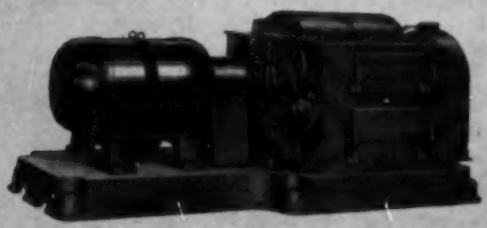


"13" Series. Three sizes. Capacity up to 6 TPH. For experimental runs, testing, and pilot plant operations.

THERE'S AN *American* ROLLING RING CRUSHER . . . FOR YOUR OPERATION!



"WC" Series. 4 sizes. Capacities up to 90 TPH. Available with drop cage. Compact, requires minimum headroom.



"AC" Series. 17 sizes. Capacities up to 800 TPH. Dual adjustability for easy size control. Drop cage for easy cleanout.

WRITE for details today. Describe your crushing needs.

American PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

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New BELKNAP COAL WASHING SYSTEM

OFFERS SMALL AND MEDIUM-SIZED COMPANIES IMPORTANT features for "Packaged Plants", including these primary essentials —basic structure—prescreening and sizing—*duplex washing*—closed system solution recovery—sludge recovery—storage and salvage tanks—pumps—all engineered and designed to fit your present operation . . .

Investigate These Advantages

1. Low Capital Investment—The purchase price of a Belknap System is less than that of other systems providing duplicate features.

2. Low Calcium Chloride Consumption—Tests show cost range from 1.9 to 3.5 cents per ton in the five most recent plant installations of the New System.

3. Low Water Consumption—Water may be a serious problem confronting many operators. Water consumption in the above new plants has averaged less than three gallons per ton of coal washed.

4. Low Maintenance and Operating Costs—Example: A company quoted on operating cost of less than 5¢ per ton with a mantenance cost of about ½¢ per ton over a four-year operating period. Power consumption was very low in comparison with other systems which they operated.

5. Sludge Recovery—In the New Belknap System the sludge is recovered as cleaned slack on the desludging unit.

6. Closed System—By using a Solution Recovery System during operation and a Salvage Tank for draining the washer during maintenance and inspection, no solution is wasted to the streams.

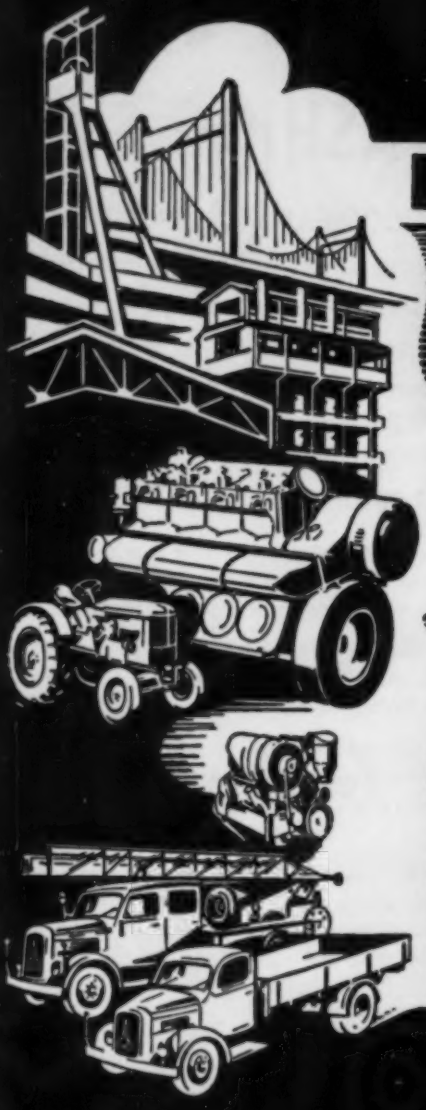
7. Automatic Specific Gravity and Level Control—With the Automatic Control minimum manual supervision is required to obtain maximum cleaning efficiency.

The NEW BELKNAP COAL WASHING SYSTEM is available in capacities from 40 tons to 250 tons per hour and size ranges as wide as 7" x ⅜". (¼" on special applications.)

FP
FUEL PROCESS COMPANY

The NEW BELKNAP COAL WASHING SYSTEM has been developed and proved during the last three years in new plants in West Virginia, Virginia, Pennsylvania and Indiana.

FUEL PROCESS COMPANY
"D" at 10th AVE.··· SOUTH CHARLESTON··· WEST VIRGINIA



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Otto-, Gas-, Diesel-Engines for Every Purpose of Two- and Four-Stroke design. Output range 3–1500 H.P. Cooled by water or air. Diesel-powered tractors. Diesel locomotives. Gas producer plants.

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Trucks and busses driven by air-cooled DEUTZ Diesel engines. Vehicles for municipal services. Fire ladders, fire engines. Fire fighting water trucks. Two-wheeled ladders. Fire fighting equipment.

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LEADOLENE
Klingfast

THE "IP"* LUBRICANT

PROVES PROFITABLE FOR THE TOUGH LUBRICATING JOBS



IN MECHANIZED MINING

Specifically compounded for your particular needs, LEADOLENE KLINGFAST is a tough, lead-based lubricant with a great variety of applications in the coal industry. This lubricant . . . with its "indestructible pH-ilm" making possible efficient lubrication even in the presence of coal dust and other abrasive factors . . . regularly reduces costs and extends equipment life on the toughest of applications.

We suggest you read the accompanying case histories to see what LEADOLENE KLINGFAST has done for others . . . then describe your toughest lubrication problem and Brooks will prepare a sample designed to give best service on that particular application.

*I.P. . . . "Indestructible pH-ilm," capable of withstanding pressures up to 50,000 psi.

The Brooks Oil Co.

Since 1876

Executive Offices and [illegible] ....CLEVELAND, OHIO
Executive Sales Office[illegible] .....PITTSBURGH, PA.
Canadian Office and [illegible] .....HAMILTON, ONTARIO
Cuban Office.....SANTIAGO de CUBA

Warehouses in Principal Cities

Case Studies

WIRE ROPE

A certain strip mining shovel, on which a conventional lubricant was used, had a wire rope failure on an average of every 18 days of service. A single application of KLINGFAST extended the service to a record of 31 days.

CORROSION PROTECTION

Due to sulphurous and other extremely corrosive agents used in quenching, the steel work in and around the quencher station of by-products coke plants is subjected to most severe corrosion. In one specific application maintenance costs were particularly high since no paint would protect for as much as a year. A grade of KLINGFAST, which was brushed on as a protector coating, gave in excess of two years of protection.

OPEN GEARS

A motor-operated hoist equipped with double herringbone cut teeth pinions and gears is used to operate 5-ton clam shell buckets at a large coke plant. Although a high grade plastic compound was applied every 24 hours, it failed to prevent wear of the gearing. On this application, which includes intermittent operation, reversing, high speed, severe shock and contamination from coal dust, KLINGFAST is applied only once every 10 days, and costs 25% less per pound than the lubricant it replaced.

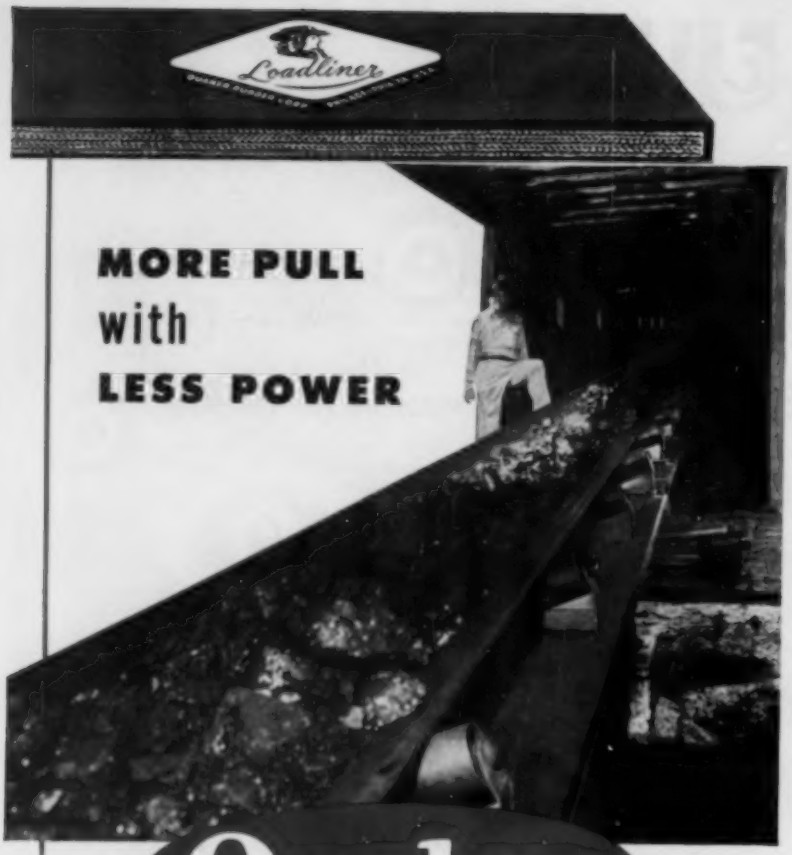
DIPPER STICKS

Due to excessive moisture and other conditions, a company had to lubricate their shovel dipper stick once each day. Since KLINGFAST has been adopted as their standard, lubrication application now is necessary only once every three weeks.

MINE EQUIPMENT

Mining machines are quite a problem in lubrication because of water, dust, shock, vibration, speed and excessive loading. LEADOLENE fluids have proven a great advantage in the gear cases of loaders in one large mine because of repellence of water, adhesiveness to prevent excessive leakage, high film strength to prevent wear of gears and worms and other characteristics for this tough job. Lubricants take a terrific beating and LEADOLENE is one that stands up and takes it.

Write Today for Free Sample!



Quaker

LOADLINER
CONVEYOR BELT

Hauling heavy loads with less power is no problem for the Loadliner. Sturdy rayon carcass makes it lighter and thinner than ordinary cotton-carcass belts of equal strength. Highly flexible for good troughability in all weather. Abrasion and mildew resistant. Exceptional fastener—holding strength. Skim coat between plies. Ideal for use on operations calling for long conveyor distances. Available in any length with any number of plies. Widths up to 72". For lower cost per unit carried, use the Loadliner—another Quaker quality product for stand-up endurance.

Write for free folder and name of nearest distributor.

Belting, Hose, Packing and Moulded Rubber of every construction for every need.

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DIVISION OF H. K. PORTER COMPANY, INC.
OF PITTSBURGH
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Branches in Principal Cities

Couplings (Cont'd)

Westinghouse Electric Corp., 401 Liberty Ave., Pittsburgh 30, Pa. (ADV., insert fol. pg 108)

Whitney Chain Co., 237 Hamilton St., Hartford 2, Conn.

GEARS, PINIONS

Allis-Chalmers Mfg. Co., 888 S. 70th St., Milwaukee 1, Wis. (ADV., pg 101, 123, 164)

American Brake Shoe Co., American Manganese Steel Div., 434 E. 14th St., Chicago Heights, Ill.

Chain Belt Co., 4786 W. Greenfield Ave., Milwaukee 1, Wis. (ADV., pg 247)

Continental Gin Co., 4500 Fifth Ave., S., Birmingham, Ala. (ADV., pg 129)

De Laval Steam Turbine Co., 300 Nottingham Way, Trenton 2, N. J.

Falk Corp., 3001 W. Canal St., Milwaukee 1, Wis.

Farrel-Birmingham Co., 25 Main St., Ansonia, Conn.

Foote Bros. Gear & Machine Corp., 4545 S. Western Blvd., Chicago 9, Ill.

D. O. James Mfg. Co., 1114 W. Monroe St., Chicago, Ill.

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

W. A. Jones Foundry & Machine Co., 4463 Roosevelt Rd., Chicago 24, Ill.

Kanawha Mfg. Co., Box 1786, Charleston, W. Va. (ADV., pg 95)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Philadelphia Gear Works, G St. & Erie Ave., Philadelphia 34, Pa.

Pittsburgh Gear Co., 27th & Smallman Sts., Pittsburgh 22, Pa. (ADV., pg 134)

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Tool Steel Gear & Pinion Co., 97 Elmwood Pl., Cincinnati 16, Ohio

Vulcan Iron Works, Wilkes-Barre, Pa. (ADV., 215)

Webster Mfg. Co., Tiffin, Ohio

Westinghouse Electric Corp., 401 Liberty Ave., Pittsburgh 30, Pa. (ADV., insert fol. pg 108)

Wilmot Engineering Co., Markle Bank Bldg., Hazleton, Pa. (ADV., pg 91)

PILLOW BLOCKS

Ahlberg Bearing Co., 3029 W. 47th St., Chicago 32, Ill.

American Pulley Co., 4200 Wissahickon Ave., Philadelphia, Pa.

Chain Belt Co., 4786 W. Greenfield Ave., Milwaukee 1, Wis. (ADV., pg 247)

Continental Gin Co., 4500 Fifth Ave., S., Birmingham, Ala. (ADV., pg 129)

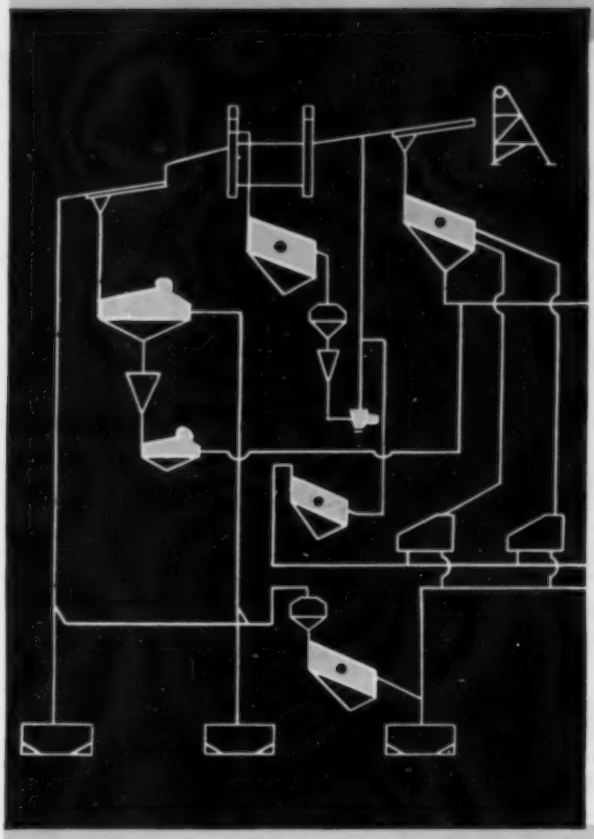
Dodge Mfg. Corp., Mishawaka, Ind. (ADV., insert fol. pg 92)

Hewitt-Robins, Inc., Robins Conveyors Div., 270 Passaic Ave., Passaic, N. J. (ADV., pg 18-19)

Robt. Holmes & Bros., Inc., 520 Junction Ave., Danville 1, Ill. (ADV., pg 85)

FOR Profitable COAL PREPARATION

ALLIS-CHALMERS Vibrating SCREENS



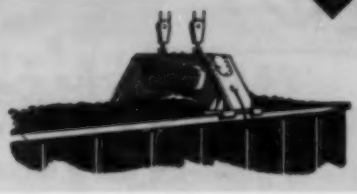
- for sizing ROM coal.
- for dry sizing raw coal ahead of cleaning units.
- for sizing and dewatering coarse coal after cleaning units.
- for sizing moist fine coal.
- for wet sizing raw coal ahead of cleaning units.
- for dewatering refuse after cleaning units.
- for media recovery after heavy media cleaning units.
- for dewatering fine coal after cleaning units.
- for sizing washed and crushed coal.
- for dewatering sludge — solids recovery.
- for sizing fine coal after dry cleaning units.

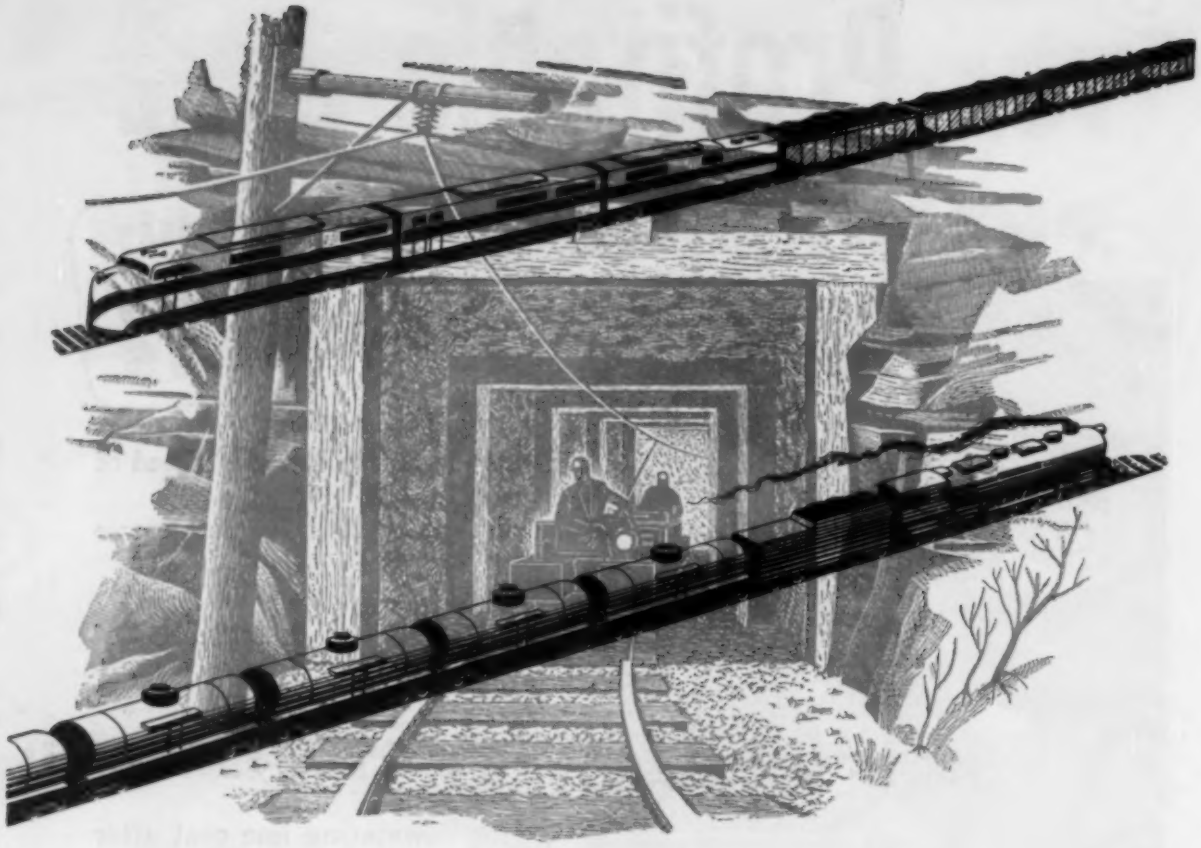
More Allis-Chalmers vibrating screens are used in the coal industry than any other make! Operators find it *profitable* to specify screens from the broad range of types and sizes offered by Allis-Chalmers because they can match the screen to the job. All of these screens have been specifically engineered for a special job in coal preparation. Be sure to send for new Vibrating Screen Selection Guide, Bulletin 25C6280E. Get it from your Allis-Chalmers representative in your area or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

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COAL serves the oil industry

Much has been said recently concerning the natural competition between coal and oil . . . our two greatest sources of energy. But the fact remains that both industries always have and always will work for each other.

Cities Service research men are constantly at work designing new and better lubricants to make the coal man's job easier. What's more, Cities Service has made available to the entire mining industry expert Cities Service Lubrication Engineers. THESE MEN CAN HELP YOU. Their quick, concise lubrication survey can mean important dollar-savings and time-saving. The Cities Service lubricants that they might recommend can do the finest job throughout your operation. Why not get your free lubrication survey from an expert Cities Service Lubrication Engineer? If you're operating at maximum efficiency, he'll be quick to tell you so. If improvements can be made, he'll show you where. For his invaluable FREE services, call or write the office nearest you or the Cities Service Oil Company, Sixty Wall Tower, New York City 5, New York.

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Pillow Blocks (Cont'd)

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

W. A. Jones Foundry & Machine Co., 4463 Roosevelt Ave., Chicago 24, Ill.

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Medart Co., 100 Potomac St., St. Louis 18, Mo.

Norma-Hoffman Bearings Corp., Stamford, Conn.

SKF Industries, Inc., Front St. & Erie Ave., Philadelphia 32, Pa. (ADV., pg 158)

Sprout, Waldron & Co., 100 Sherman Ave., Muncy, Pa.

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Webster Mfg. Co., Tiffin, Ohio

T. B. Wood's Sons Co., Chambersburg, Pa.

SPEED REDUCERS

Allis-Chalmers Mfg. Co., 888 S. 70th St., Milwaukee 1, Wis. (ADV., 101, 123, 164)

Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland 4, Ohio

Continental Gin Co., 4500 Fifth Ave., S., Birmingham, Ala. (ADV., pg 129)

De Laval Steam Turbine Co., 300 Nottingham Way, Trenton 2, N. J.

Dodge Mfg. Corp., Mishawaka, Ind. (ADV., insert fol. pg 92)

Eberhardt-Denver Co., 1429 Colfax Ave., Denver 4, Colo.

Falk Corp, 3001 W. Canal St., Milwaukee 8, Wis.

Farrel-Birmingham Co., 25 Main St., Ansonia, Conn.

Foote Bros. Gear & Machine Co., 4545 S. Western Blvd., Chicago 9, Ill.

D. O. James Mfg. Co., 1114 W Monroe St., Chicago, Ill.

W. A. Jones Foundry & Machine Co., 4463 Roosevelt Rd., Chicago 24, Ill.

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Medart Co., 100 Potomac St., St. Louis 18, Mo.

Philadelphia Gear Works, G St. & Erie Ave., Philadelphia 34, Pa.

Reeves Pulley Co., 1225 Seventh St., Columbus, Ind.

Smith Power Transmission Co., 1545 E. 23d St., Cleveland 14, Ohio

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Westinghouse Electric Corp., 401 Liberty Ave., Pittsburgh 30, Pa. (ADV., insert fol. pg 108)

Worthington Corp., Harrison, N. J.

SPROCKETS, SHEAVES, PULLEYS

American Brake Shoe Co., American Manganese Steel Div., 434 E. 14th St., Chicago Heights, Ill.

Continental Gin Co., 4500 Fifth Ave., S., Birmingham, Ala. (ADV., pg 129)

Dodge Mfg. Corp., Mishawaka, Ind. (ADV., insert fol. pg 92)



At the Ilmenn Plant of Pocahontas Fuel Co., Pocahontas, Va., dust is captured at the air plant (left) in Pangborn Dust Collectors.

Close-up of Pangborn Dust Collector operating within plant.

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PANGBORN DUST CONTROL

More mechanization and more production have helped the coal industry meet industry's vastly increased demands over the past decade. But they have created a serious problem for coal processing plants. If *you* face this problem—it will pay you to look to Pangborn Dust Control for the answer!

Pangborn Dust Control traps dust at the source—at tipples, dry cleaning, de-dusting and other operations. And Pangborn Dust Control saves you money, pays for itself by . . . (1) improving the reclamation of valuable dust . . . (2) lowering plant maintenance costs . . . (3) increasing the life of your machines because they operate in a cleaner atmosphere. What's more, higher morale and better health of employees mean increased production.

If you're losing profits because of excessive dust, let Pangborn engineers conduct a free Dust Pocket Survey. It costs you nothing but can mean big savings. Write today for details and your free copy of Bulletin 909A. Just address: PANGBORN CORPORATION, 2800 Pangborn Blvd., Hagerstown, Maryland.

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STOPS THE DUST HOG from stealing profits

Sprockets, Etc. (Cont'd)

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Kanawha Mfg. Co., Box 1786, Charleston, W. Va. (ADV., pg 95)

Kensington Steel Co., 305 Kensington Ave., Chicago 28, Ill.

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McLanahan & Stone Corp., Hollidaysburg, Pa. (ADV., pg 99)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Morse Chain Co., 7601 Central Ave., Detroit 8, Mich.

Philadelphia Gear Works, G St. & Erie Ave., Philadelphia 34, Pa.

Pittsburgh Gear Co., 27th & Smallman Sts., Pittsburgh 22, Pa. (ADV., pg 134)

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

Tool Steel Gear & Pinion Co., 97 Elmwood Pl., Cincinnati 16, Ohio

Whitney Chain Co., 237 Hamilton St., Hartford 2, Conn.

VARIABLE-SPEED DRIVES

Allis-Chalmers Mfg. Co., 888 S. 70th St., Milwaukee 1, Wis. (ADV., pg 101, 123, 164)

Dodge Mfg. Corp., Mishawaka, Ind. (ADV., insert fol. pg 92)

Falk Corp., 3001 W. Canal St., Milwaukee 8, Wis.

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Reeves Pulley Co., 1225 7th St., Columbus, Ind.

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Worthington Corp., Harrison, N. J.

V-BELTS

Allis-Chalmers Mfg. Co., 888 S. 70th St., Milwaukee 1, Wis. (ADV., pg 101, 123, 164)

Browning Mfg. Co., Maysville, Ky.

Continental Gin Co., 4500 Fifth Ave., S., Birmingham, Ala. (ADV., pg 129)

Dayton Rubber Co., Woodside Bldg., Greenville, S. C.

Dodge Mfg. Corp., Mishawaka, Ind. (ADV., insert fol. pg 92)

Durkee-Atwood Co., 215 N. E. 7th St., Minneapolis 13, Minn.

Gates Rubber Co., 999 S. Broadway, Denver 17, Colo. (ADV., insert fol. pg 108)

L. H. Gilmer Co., Cottman & Keystone Sts., Philadelphia 35, Pa.

Goodall Rubber Co., 430 Whitehead Rd., Trenton 4, N. J.

B. F. Goodrich Co., Akron 11, Ohio (ADV., pg 1, 211)

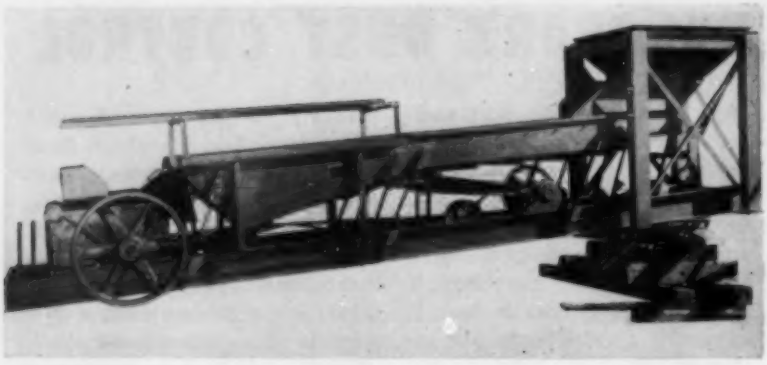
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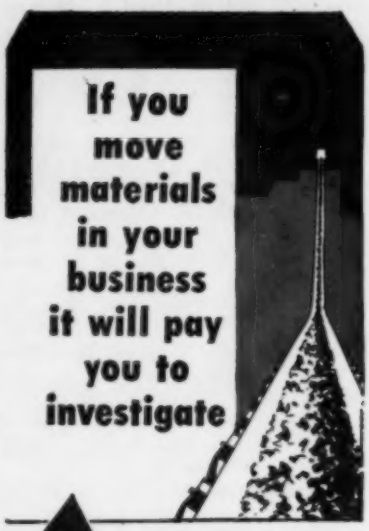
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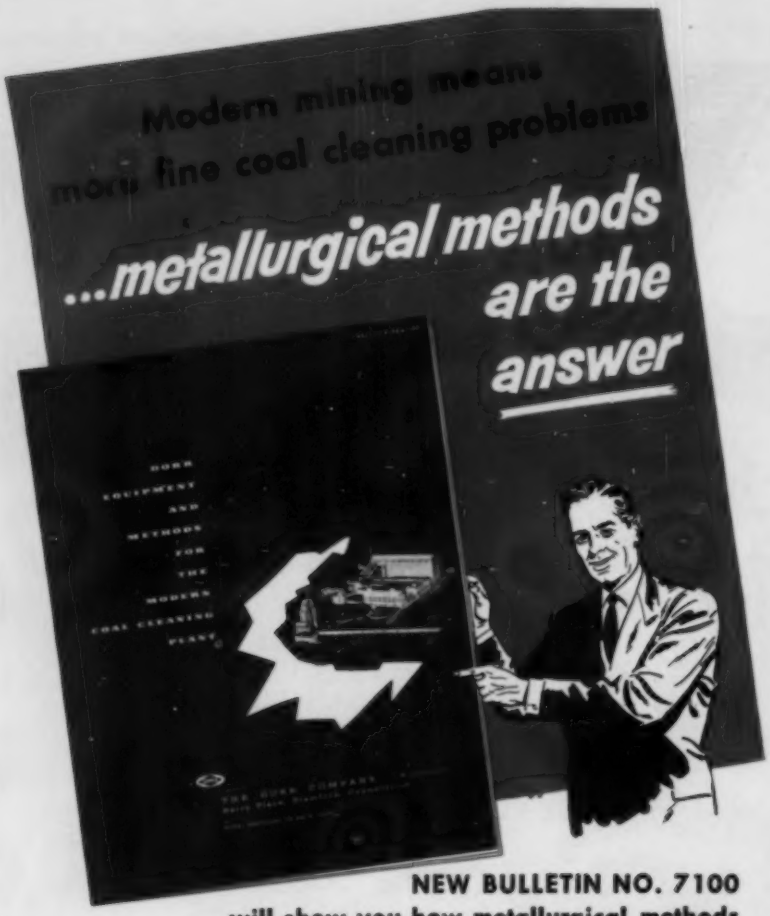
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V-Belts (Cont'd)

Goodyear Tire & Rubber Co., 1144 E. Market St., Akron 16, Ohio

Lee Tire & Rubber Co., Republic Rubber Div., Youngstown 1, Ohio

Manheim Mfg. & Belting Co., Manheim, Pa.

Quaker Rubber Corp., Philadelphia 24, Pa. (ADV., pg 122)

Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N. J. (ADV., pg 113)

Thermoid Co., 315 Whitehead Rd., Trenton 6, N. J. (ADV., pg 199)

United States Rubber Co., 1230 Ave. of the Americas, New York 20, N. Y. (ADV., Third Cover)

Worthington Corp., Harrison, N. J.

Preparation Builders

Allen & Garcia Co., 332 S. Michigan Ave., Chicago, Ill. (ADV., pg 93)

Chance Coal Cleaner, Mears Bldg., Scranton, Pa.

Daniels Co. Contractors, Inc., 22 N. 5th St., Indiana, Pa. (ADV., pg 161)

Nelson L. Davis Co., 343 S. Dearborn St., Chicago 4, Ill.

Denver Equipment Co., 1414 17th St., Denver 2, Colo.

Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

Haworth Engineering & Mfg. Co., 930 2d Ave., Birmingham 4, Ala.

Heyl & Patterson, Inc., 55 Ft. Pitt Blvd., Pittsburgh 22, Pa. (ADV., pg 86-87)

Robt. Holmes & Bros., Inc., 520 Junction Ave., Danville 1, Ill. (ADV., pg 85)

Industrial Engineering & Construction Co., 409 Fourth St., Fairmont, W. Va. (ADV., pg 157)

Interstate Engineers & Constructors, Inc., 208 Newton St., Fairmont, W. Va.

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Kanawha Mfg. Co., Box 1786, Charleston, W. Va. (ADV., pg 95)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Menzies Separator Co., Farr Bldg., Scranton, Pa.

Mines Engineering Co., 20 N. Wacker Dr., Chicago 6, Ill.

K. Prins & Associates, Box 46, Wellston, Ohio

Roberts & Schaefer Co., 130 N. Wells St., Chicago 6, Ill. (ADV., pg 112)

Southwestern Engineering Co., 4800 Santa Fe Ave., Los Angeles 11, Calif.

Templeton-Matthews Corp., Sycamore Bldg., Terre Haute, Ind. (ADV., pg 130)

Western Knapp Engineering Co., Div. Western Machinery Co., 760 Folsom St., San Francisco 7, Calif. (ADV., pg 79)

Wilmot Engineering Co., Markle Bank Bldg., Hazleton, Pa. (ADV., pg 91)

Pulleys—See Power Transmission

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Allen-Sherman-Hoff Pump Co., 259 E. Lancaster Ave., Wynnewood, Pa.

Allis-Chalmers Mfg. Co., 888 S. 70th St., Milwaukee 1, Wis. (ADV., pg 101, 123, 164)

Aurora Pump Co., 111 Loucks St., Aurora, Ill. (ADV., pg 162)

American Brake Shoe Co., American Manganese Steel Div., 434 E. 14th St., Chicago Heights, Ill.

Barrett, Haentjens & Co., Hazleton, Pa.

Carver Pump Co., Muscatine, Iowa

Chain Belt Co., 4786 W. Greenfield Ave., Milwaukee 1, Wis. (ADV., pg 247)

Colorado Iron Works Co., 1624 17th St., Denver 2, Colo. (ADV., pg 98)

Construction Machinery Co., Waterloo, Iowa

De Laval Steam Turbine Co., 300 Nottingham Way, Trenton, N. J.

Deming Co., Salem, Ohio (ADV., pg 150)

Denver Equipment Co., 1414 17th St., Denver 17, Colo.

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

Flood City Brass & Electric Co., Johnstown, Pa. (ADV., pg 139)

Food Machinery & Chemical Corp., Peerless Pump Div., 303 W. Ave. 26, Los Angeles 36, Calif.

Galigher Co., Box 209, Salt Lake City 4, Utah

Gardner-Denver Co., Quincy, Ill.

Georgia Iron Works Co., 605 12th St., Augusta, Ga.

Gorman-Rupp Co., 305 Bowman St., Mansfield, Ohio (ADV., pg 136)

Goulds Pumps, Inc., Fall St., Seneca Falls, N. Y.

Goyne Steam Pump Co., Ashland, Pa. (ADV., pg 152)

Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

Johnston Pump Co., 3272 E. Foothill Blvd., Pasadena 8, Calif.

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Layne & Bowler, Inc., Box 6697, Memphis 8, Tenn.

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Morris Machine Works, Baldwinsville, N. Y. (ADV., pg 104)

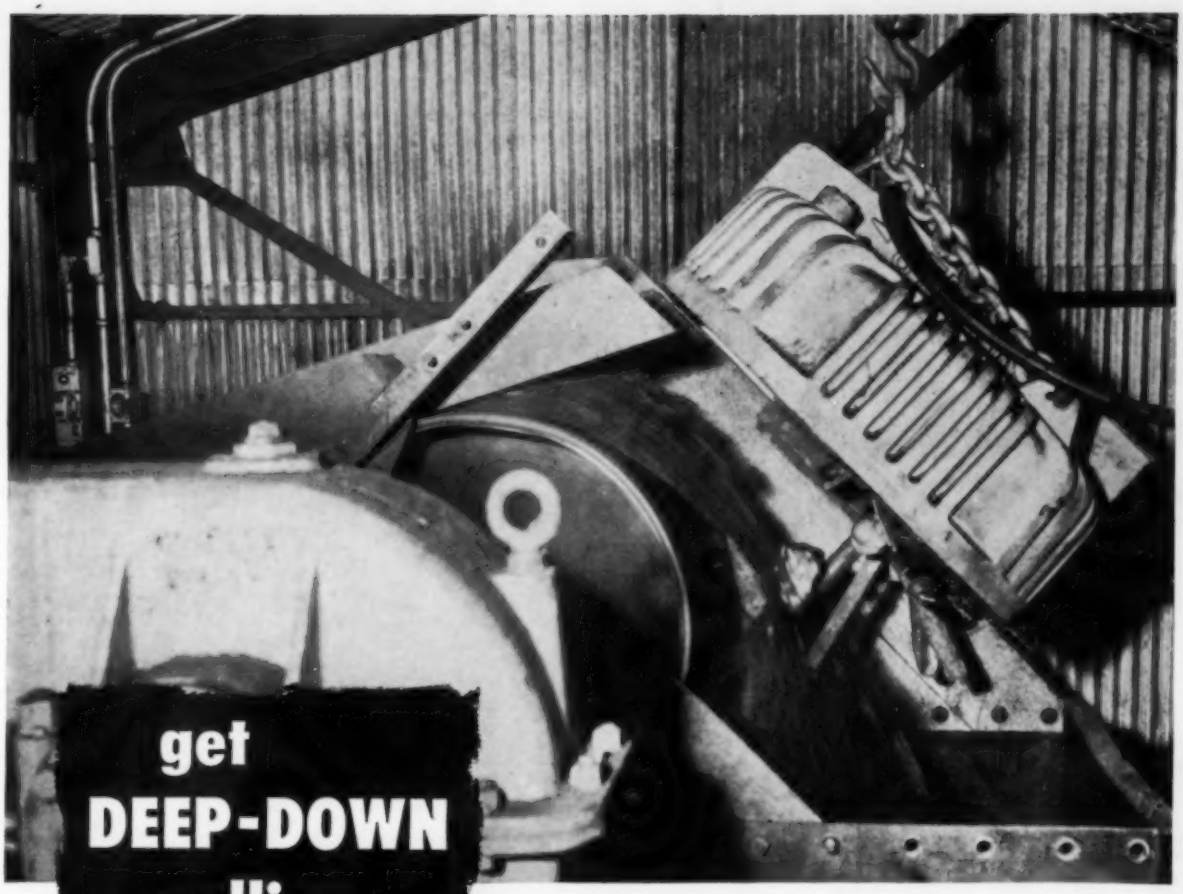
Nagle Pumps, 1237 Center Ave., Chicago Heights, Ill.

Pettibone-Mulliken Corp., 4700 W. Division St., Chicago 51, Ill.

Rice Pump & Machine Co., Belgium, Wis.

Warren Steam Pump Co., 30 Bridges Ave., Warren, Mass.

Weinman Pump Mfg. Co., 270 Spruce St., Columbus 8, Ohio



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A. R. Wilfley & Sons, Inc., Box 2330, Denver 1, Colo.

Worthington Corp., Harrison, N. J.

DIAPHRAGM

Denver Equipment Co., 1414 17th St., Denver 17, Colo.

Dorr Co., Barry Pl., Stamford, Conn. (ADV., pg 128)

Eimco Corp., 634 S. 4th West St., Salt Lake City 10, Utah. (ADV., pg 145)

Galigher Co., Box 209, Salt Lake City 4, Utah

Hardinge Co., 240 Arch St., York, Pa.

Oliver United Filters, Inc., 33 W. 42d St., New York 17, N. Y. (ADV., pg 143)

Western Machinery Co., 760 Folsom St., San Francisco 7, Calif. (ADV., pg 79)

Reducers, Speed—See Power Transmission

Retarder, Pullers

Brown-Fayro Co., 940 Ash St., Johnstown, Pa. (ADV., pg 144)

Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Continental Gin Co., 4500 Fifth Ave., S., Birmingham, Ala. (ADV., pg 129)

Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

Robt. Holmes & Bros., Inc., 520 Junction Ave., Danville 1, Ill. (ADV., pg 85)

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Kanawha Mfg. Co., Box 1786, Charleston, W. Va. (ADV., pg 95)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Webster Mfg. Co., Tiffin, Ohio

Refuse Disposal

AERIAL TRAMWAYS

Riblet Tramway Co., Box 7, Station A, Spokane, Wash.

John A. Roebling's Sons Corp., Trenton 2, N. J. (ADV., pg 47)

United States Steel Corp., American Steel & Wire Div., Rockefeller Bldg., Cleveland 13, Ohio. (ADV., pg 12-13, 24-25, 77)

Columbia-Geneva Steel Div., Russ Bldg., San Francisco 4, Calif. (ADV., pg 12-13, 24-25, 77)

Yara Engineering Corp., Interstate Equipment Div., Elizabeth 4, N. J.

LARRIES

Atlas Car & Mfg. Co., 1100 Ivanhoe Rd., Cleveland 10, Ohio

Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Differential Steel Car Co., Findlay, Ohio (ADV., pg 250)

Heyl & Patterson, Inc., 55 Ft. Pitt Blvd., Pittsburgh 22, Pa. (ADV., pg 86-87)

TRUCKS

Athey Products Corp., 5631 W. 65th St., Chicago 38, Ill. (ADV., pg 236-237)

Autocar Co., Exton, Pa.

Chevrolet Motor Div., General Motors Corp., General Motors Bldg., Detroit 2, Mich. (ADV., pg 149)

Dart Truck Co., Oak at 27th St., Kansas City 8, Mo.

Dodge Div., Chrysler Corp., Detroit, Mich.

Euclid Road Machinery Co., 1361 Chardon Rd., Cleveland 17, Ohio

Ford Motor Co., Dearborn, Mich.

Four Wheel Drive Co., Clintonville, Wis.

GMC Truck & Coach Div., General Motors Corp., General Motors Bldg., Detroit 2, Mich.

International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 239, insert fol. pg 36)

Klockner-Humboldt-Deutz AG, Koln, Germany (ADV., pg 120)

Koehring Co., 3026 W. Concordia Ave., Milwaukee 16, Wis. (ADV., pg 16-17)

LeTourneau-Westinghouse Corp., Peoria, Ill.

Oshkosh Motor Truck, Inc., Oshkosh, Wis.

Linn Mfg. Corp., Morris, N. Y.

Mack Trucks, Inc., 350 Fifth Ave., New York 1, N. Y.

Reo Motors, Inc., Lansing, Mich.

Walter Motor Truck Co., 1001 Irving Pl., Ridgewood 27, N. J.

TRUCK BODIES

Easton Car & Construction Co., Easton, Pa.

Galion Allsteel Body Co., 605 S. Market St., Galion, Ohio

Gar Wood Industries, Inc., Wayne Div., Wayne, Mich.

Heil Co., 3000 W. Montana St., Milwaukee 1, Wis.

Hercules Steel Products Corp., Sherman St., Galion, Ohio

Koehring Co., 3026 Concordia Ave., Milwaukee 16, Wis. (ADV., pg 16-17)

Marion Metal Products Corp., Cheney Ave., Marion, Ohio

River Loading—See Loading Equipment

Roofing & Siding

ALUMINUM

Aluminum Co. of America, Gulf Bldg., Pittsburgh 19, Pa.

Kaiser Aluminum & Chemical Sales, Inc., Kaiser Bldg., Oakland 12, Calif.

Reynolds Metals Co., 2500 S. Third St., Louisville 1, Ky.

ASBESTOS-CEMENT

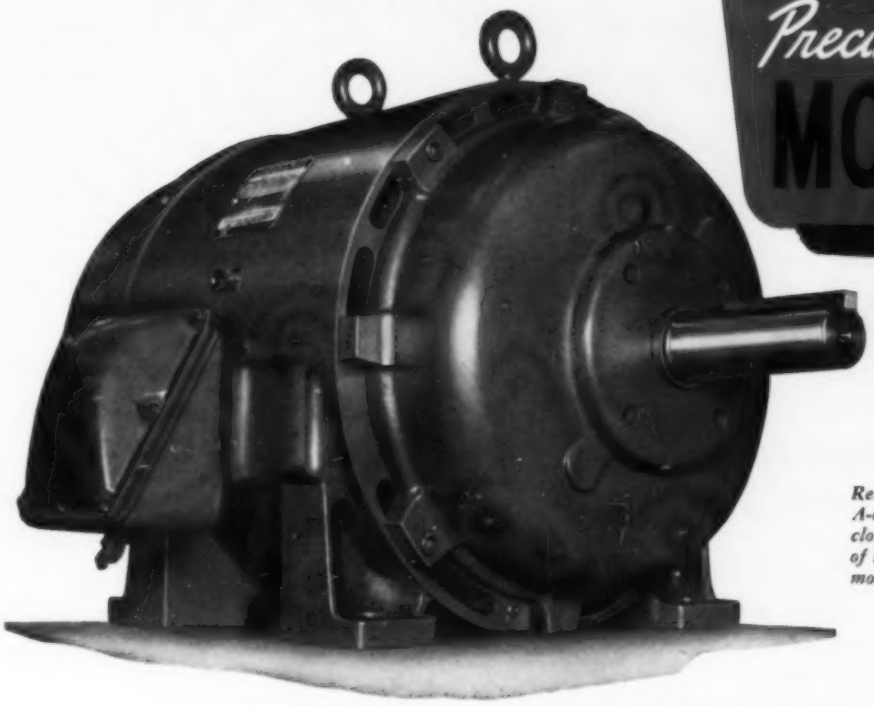
Johns-Manville, 22 E. 40th St., New York 16, N. Y.

Keasbey & Mattison Co., 1953 Mitchell Ave., Ambler, Pa.

FOR CLEANING-PLANT SERVICE...

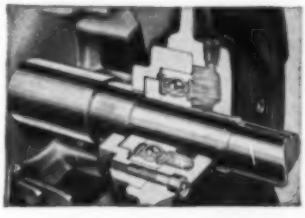
"All motors are NOT alike!"

RELIANCE
Precision-Built
MOTORS



Reliance Totally-enclosed Fan-cooled A-c. Motor. All other standard enclosures available, with wide choice of mechanical designs and special mountings. Ratings from 3/4 to 300 hp.

- ☆ **Tough, vibration-proof Reli-X insulation**
- ☆ **Heavy dust-proof conduit-box and motor lead assembly**
- ☆ **Shock-resistant frame and bearing-bracket construction**



. . . AND THE BEST PRE-LUBRICATED BEARING DESIGN
The Reliance pre-lubricated bearing provides *four times more operating hours without re-lubrication* than any other bearing used in motors today. And—whatever your lubrication schedule—*you just can't grease 'em wrong!* To get the complete "inside story" on motor bearings, write today for Bulletin B-2201. It contains hard facts on the advantages of the Reliance pre-lubricated bearing design, with cutaway view, cross-section diagram, comparison chart, and statements by bearing manufacturers. B-1484G

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Can You Check YES to these five questions?

- ☐ Do the gears you use have surface-hardened teeth?
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If not, you should use —

PITTSBURGH purple —Your Guarantee of Longer Life

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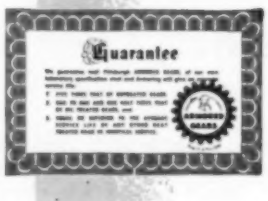
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Roofing & Siding (Cont'd)

PROTECTED-METAL

Plasteel Products Corp., 15 McAdam Ave., Washington, Pa.

H. H. Robertson Co., Farmers Bank Bldg., Pittsburgh, Pa.

Toledo Porcelain Enamel Products Co., Waltham, Mass.

STEEL

Armco Steel Corp., Middletown, Ohio

Bethlehem Steel Co., Bethlehem, Pa. (ADV., pg 20, 36, 44)

Inland Steel Co., 38 S. Dearborn St., Chicago 3, Ill.

Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio (ADV., pg 223)

United States Steel Corp., William Penn Pl., Pittsburgh 30, Pa. (ADV., pg 77)

Youngstown Sheet & Tube Co., Stambaugh Bldg., Youngstown, Ohio (ADV., insert fol. pg 108)

ZINC

Illinois Zinc Co., 2959 W. 47th St., Chicago 32, Ill.

New Jersey Zinc Co., 160 Front St., New York 7, N. Y.

Steelcraft Mfg. Co., 9066 Blue Ash Rd., Rossmoyne, Ohio

Safety Equipment

EYE PROTECTION, HARD HATS, SHOES, SAFETY BELTS, ETC.

American Optical Co., Southbridge, Mass.

E. D. Bullard Co., 275 8th St., San Francisco 3, Calif.

International Shoe Co., 1509 Washington Ave., St. Louis 3, Mo.

Lehigh Safety Shoe Co., Allentown, Pa.

Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa. (ADV., pg 14-15)

Willson Products, Inc., 108 Thorn St., Reading, Pa.

Salt—See Freezeproofing

Sampling, Sample Preparation

AUTOMATIC SAMPLERS

Denver Equipment Co., 1414 17th St., Denver 17, Colo.

Galigher Co., Box 209, Salt Lake City 4, Utah

Heyl & Patterson, Inc., 55 Ft. Pitt Blvd., Pittsburgh 22, Pa. (ADV., pg 86-87)

FLOAT-AND-SINK TESTERS

Reich Bros. Mfg. Co., 1439 Ash St., Terre Haute, Ind.

the BIG ONES *are Lubricated by* WHITMORE



Total Weight—2,410,000 lbs. • Dipper Capacity—25 cu. yds.
Dipper Weight (full load)—130,000 lbs.



Total Weight—3,200,000 lbs. • Boom—107 feet
Empty Dipper Wt.—42 tons • Dipper Capacity—40 cu. yds.

THERE'S A REASON WHY— most all of the big shovels and draglines are being lubricated with WHITMORE'S Pressure-Proof Lubricants!

We know from long, hard experience that there is no one cure-all lubricant for every purpose. As a matter of fact, requirements of the same gears, bearings, etc., vary from one piece of equipment to the next. Each needs to be studied—lived with—to gain the full knowledge as to just what lubricant will really do the job. Therefore, Whitmore Engineers do live on the job during an extensive survey which will give the answers — we guarantee it!

Write or call us today. Let us prove that we can save you money through prolonged life of parts, elimination of breakdown time and increased efficiency.

WHITMORE'S
PRESSURE-PROOF
LUBRICANTS
SUPER E.P.

THE WHITMORE MFG. CO., Factory and General Offices, CLEVELAND 4, OHIO, U. S. A.

STOP *Pumping Troubles*
CUT *Maintenance Costs*
AVOID *Costly Shut-downs*



GORMAN-RUPP PUMPS SAVE MONEY

Pumping troubles are greatly reduced and 40% of costs saved with the increased efficiency of the GORMAN-RUPP design. 3 H.P. does what formerly required 5 H.P.

Maintenance problems are minimized due to the extreme simplicity of design — the impeller is the only moving part. Any wearing parts are quickly and easily replaced with common tools. Pumps are furnished bronze fitted, and of all-bronze construction.

Costly shutdowns are practically eliminated. Gorman-Rupp pumps run indefinitely, with little or no attention. Automatically self-priming — ideal for remote location and control, these pumps require very low headroom, are efficient, reliable, and maintain nearly normal capacity under any working head.

All GORMAN-RUPP pumps are **guaranteed** in plain language.

Write for Bulletin No. O-ME-11



FOR STRIP MINE WATER HANDLING

GORMAN-RUPP centrifugal pumps will handle the toughest jobs, no matter how large a volume of water. They will **prime faster, higher and pump more dirty water** than any other pump of comparable size. Self-priming centrifugal pumps range in capacity from 1½-inch, 5,500 G.P.H., to the powerful 10-inch, pumping 240,000 G.P.H.

WRITE US ABOUT YOUR PUMPING PROBLEMS

DISTRIBUTORS

Auto Machine Company, Marion, Illinois
Athens Armature and Machine Co., Athens, Ohio
The Bittenbender Co., Scranton, Pa.
Buckeye Machine Supply Co., New Philadelphia, Ohio
Bluefield Supply Co., Bluefield, W. Va.
Cambridge Mach. & Supply Co., Cambridge, Ohio
Central Mine Supply Co., Mt. Vernon, Illinois
Central Mine Supply Co., Madisonville, Ky.
Greenville Supply Co., Greenville, Ky.
General Machinery Co., Birmingham, Alabama
Guyan Machinery Co., Logan, W. Va.
Hoe Supply Co., Christopher, Illinois
Industrial Supply Co., Terre Haute, Indiana
Jackson Implement Co., Jackson, Ohio
Johns Equipment Co., Ft. Wayne, Indiana
McComb Supply Co., Harlan, Ky.
Mine Service Co., Lothair, Ky.
Reliable Electric & Equip. Co., Zanesville, Ohio
Superior Sterling Co., Bluefield, W. Va.
Tennessee Mill & Mine Supply Co., Knoxville, Tenn.
West Virginia Pump & Supply Co., Huntington, W. Va.
Weinman Pump & Supply Co., Pittsburgh, Pa.

THE GORMAN-RUPP COMPANY
305 BOWMAN STREET, MANSFIELD, OHIO

Float & Sink Testers (Cont'd)

W. S. Tyler Co., 3615 Superior Ave., Cleveland 14, Ohio (ADV., pg 147)

SCREENS & SIEVES

Gilson Screen Co., Mercer, Pa. (ADV., pg 156)

Hendrick Mfg. Co., 76 Dundaff St., Carbondale, Pa. (ADV., pg 155)

Syntron Co., 408 Lexington, Homer City, Pa.

W. S. Tyler Co., 3615 Superior Ave. Cleveland 14, Ohio (ADV., pg 147)

LABORATORY CRUSHERS & PULVERIZERS

American Pulverizer Co., 1275 Macklind Ave., St. Louis 10, Mo. (ADV., pg 118)

Braun Corp., 2260 E. 15th St., Los Angeles 15, Calif.

Denver Fire Clay Co., 2301 Blake St., Denver 17, Colo.

Heyl & Patterson, Inc., 55 Ft. Pitt Blvd., Pittsburgh 22, Pa. (ADV., pg 86-87)

Robt. Holmes & Bros., Inc., 520 Junction Ave., Danville 1, Ill. (ADV., pg 85)

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Pennsylvania Crusher Co., 1704 Liberty Trust Bldg., Philadelphia 7, Pa. (ADV., pg 148)

Sturtevant Mill Co., 14 Harrison Sq., Boston 22, Mass.

Schutz-O'Neill Co., 311 Portland, Minneapolis, Minn.

O. B. Wise Co., Grand & Western Aves., Knoxville, Tenn.

Scales, Track, Truck

(See also Conveyor Weighers)

Bonded Scale & Machine Co., 2176 Third St., Columbus 7, Ohio

Buffalo Scale Co., 1200 Niagara St., Buffalo 13, N. Y.

Coxe and Stevens Aircraft Corp., Glen Cove Rd., Mineola, N. Y.

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

Howe Scale Co., 127 Strong Ave., Rutland, Vt.

Streeter-Amet Co., 4107 Ravenswood Ave., Chicago 13, Ill.

Toledo Scale Co., 1002 Telegraph Rd., Toledo 1, Ohio

Winslow Government Standard Scale Works, Inc., 25th & Haythorne Ave., Terre Haute, Ind.

Yale & Towne Mfg. Co., Roosevelt Rd., Philadelphia 15, Pa.

Screen Cloth, Bar & Wire

*(*Indicates wedge wire or bar)*

Bixby-Zimmer Engineering Co., 153 Abingdon St., Galesburg, Ill. (ADV., pg 116)

Cambridge Wire Cloth Co., 12200 Washington Blvd., Cambridge, Md.

Colorado Fuel & Iron Corp., 500 Fifth Ave., New York 5, N. Y. (ADV., insert fol. pg 36)

CHANCE PROCESS

THE ORIGINAL HEAVY-DENSITY COAL CLEANER

3-PRODUCT CHANCE CONE OFFERS ALL THESE FEATURES

- new low maintenance method of elevating refuse
- automatic refuse withdrawal
- cleans coal down to 1.35 gravity
- takes off middlings from 1.35 to 1.70 gravity
- over 99% recovery of salable coal
- cleans wide range of coal—⅛" to 10"
- one-man gravity change-over in 5 minutes
- capacities 40 tph to 600 tph

Chance Cones, in use in all the major coal producing countries of the world, are cleaning over 123,000,000 tons of coal annually. Chance Cones produce exceptionally high tonnage of specification coal at *lowest cost per ton*. Find out more about the IMPROVED Chance Cone. Write for full details today.

The new middlings take-off is optional with new equipment and can be fitted to cones already installed.

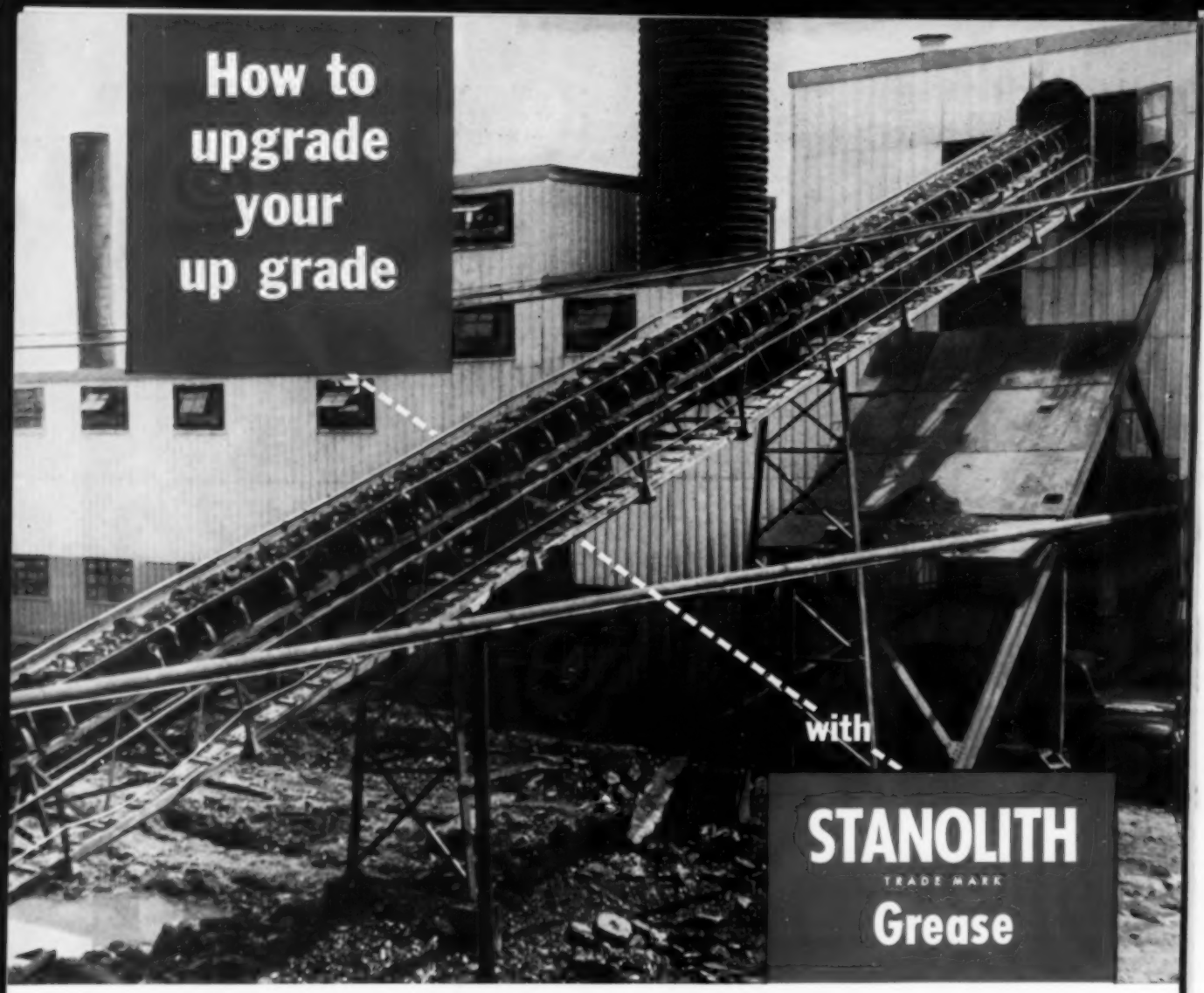


THE HEART OF THE PREPARATION PLANT

UNITED ENGINEERS & CONSTRUCTORS, INC

NEW YORK 17 PHILADELPHIA 5 CHICAGO 2

WITH A BACKGROUND OF OVER SEVENTY YEARS' EXPERIENCE



● A midwest coal mine was getting "fed up" on bearing failures on the large conveyor shown here. Dirt and coal dust, both inside and outside the preparation plant, got into the open bearings and mixing with the lubricant formed a "grinding compound." Some greases leaked out of the bearings. Others hardened and caked, making starting difficult and power requirements heavy.

When a Standard lubrication specialist was consulted he recognized the need for a grease that would seal out the dirt and, while resisting excessive thinning, would maintain a soft consistency at all times. He recommended STANOLITH Grease because it has all these desired qualities. In addition it contains an effective oxidation inhibitor which makes it exceptionally long-lasting.

Lubrication with STANOLITH proved so effective on the conveyor bearings that this grease was also put to work on the shaker screens in the preparation plant. The use of only one grease has simplified both stocking and application. Why don't you investigate how STANOLITH Grease can help *you* increase efficiency?



W. M. "Bill" Griswold of Standard Oil's Evansville, Indiana office is the Standard lubrication specialist who worked with this mine to find the right grease for a tough job. You can get the same on-the-job service from the Standard lubrication specialist in your own area. To reach him, phone your nearest Standard Oil Company office. Or write Standard Oil Company (Indiana), 910 S. Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY STANDARD *(Indiana)*

Screen Cloth (Cont'd)

Cleveland Wire Cloth & Mfg. Co., 3574 E. 78th St., Cleveland 5, Ohio

°**Hendrick Mfg. Co.**, 76 Dundaff St., Carbondale, Pa. (ADV., pg 135)

Hewitt-Robins, Inc., Robins Conveyors Div., 270 Passaic Ave., Passaic, N. J. (ADV., pg 18-19)

Hoyt Woven Wire Fabrics, Lancaster, Pa.

Ludlow-Saylor Wire Co., 634 S. Newstead Ave., St. Louis 10, Mo.

Newark Wire Cloth Co., 370 Verona Ave., Newark 4, N. J.

°N. V. Tema, 1 Nassaulaan, 'S-Gravenhage, Holland.

W. S. Tyler Co., 3615 Superior Ave., Cleveland 14, Ohio (ADV., pg 147)

°Wedge Bar Screen Corp., Far Rockaway, N. Y.

°**Wedge Wire Corp.**, Cleveland 2, Ohio (ADV., pg 115)

Screen Heating

Allis-Chalmers Mfg. Co., 888 S. 70th St., Milwaukee 1, Wis. (ADV., pg 101, 123, 164)

Deister Concentrator Co., 929 Glasgow Ave., Ft. Wayne 1, Ind.

Deister Machine Co., 1933 E. Wayne St., Ft. Wayne 4, Ind. (ADV., pg 160)

F. R. Hannon & Sons, Canton 7, Ohio (ADV., pg 92)

Hewitt-Robins, Inc., Robins Conveyors Div., 270 Passaic Ave., Passaic, N. J. (ADV., pg 18-19)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Production Equipment Corp., 2926 W. Lake St., Chicago 12, Ill.

Simplicity Engineering Co., Durand, Mich.

Screen Equipment Co., Buffalo 25, N. Y. (ADV., pg 108)

W. S. Tyler Co., 3615 Superior Ave., Cleveland 14, Ohio (ADV., pg 147)

Universal Vibrating Screen Co., Deane Blvd. & St. Paul R. R., Racine, Wis. (ADV., pg 162)

Screen Plate, Sheet

BLANK

Bethlehem Steel Co., Bethlehem, Pa. (ADV., pg 20, 36, 44)

Colorado Fuel & Iron Corp., 500 Fifth Ave., New York 5, N. Y. (ADV., insert fol. pg 36)

Inland Steel Co., 38 S. Dearborn St., Chicago 3, Ill.

Jones & Laughlin Steel Co., 3 Gateway Center, Pittsburgh 30, Pa.

United States Steel Corp., William Penn Pl., Pittsburgh, Pa. (ADV., pg 12-13, 24-25, 77)

Columbia-Geneva Steel Div., Russ Bldg., San Francisco, Calif. (ADV., pg 12-13, 24-25, 77)

Youngstown Sheet & Tube Co., Stambaugh Bldg., Youngstown, Ohio (ADV., insert fol. pg 108)

Continued on pg 144

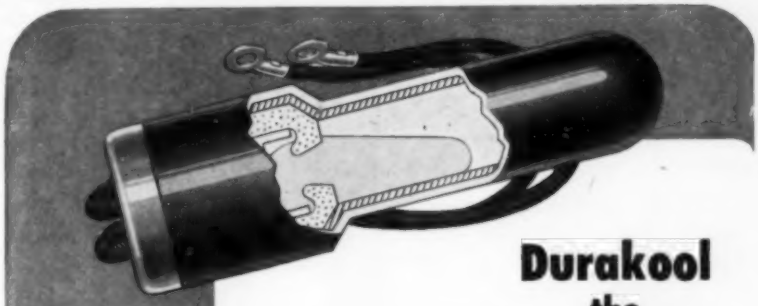


"FLOOD CITY" designs each and every pump for the individual job on which it is to be used. This small, sturdy pump is extremely simple to operate and maintain. Its open type, non-clogging impeller is ideal for many purposes. Made of anti-corrosive material of your choice it is still extremely economical both in first cost and in operation.

We have built acid resisting pumps from 1¼" to 6" capacity for many years and would welcome the opportunity to advise you on your pump problems.

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BRASS & ELECTRIC CO.

JOHNSTOWN, PA.
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the
STANDARD
OF QUALITY, DURABILITY AND LIFE

WITHSTANDS HIGH TEMPERATURES

Years of trouble-free performance on the most difficult of assignments have won top recognition for Durakool Mercury Tilt Switches. High temperatures, fast cycling and 24 hour schedules taken in stride. 7 sizes, 1 to 65 amperes. Send for Bulletin 525.

See telephone directory for local distributor or write
DURAKOOL, INC. — Elkhart, Indiana
50 St. Clair Ave., W. Toronto

Durakool ALL-STEEL MERCURY *Switches*

Choose Nothing Less than the BEST!!!



Depend on

Homer Magnetic Separators to protect costly preparation plant equipment

With thousands of dollars invested in modern, efficient preparation plant equipment, it is simply good business to protect it from the ravages of tramp iron.

Homer is interested in protecting your preparation plant equipment . . . in eliminating costly down-time and in giving you a clean product—free from Tramp Iron.

Homer maintains complete facilities for investigation and research of your magnetic separation problems. Homer also maintains an efficient, nation-wide staff of sales engineers, trained in magnetic protection procedure. We invite the use of our services. Competent recommendations made without obligation to you. The Homer Manufacturing Co., Inc., Dept. 59, Lima, Ohio.

Remember...

with a

HOMER...

you are

Certain!

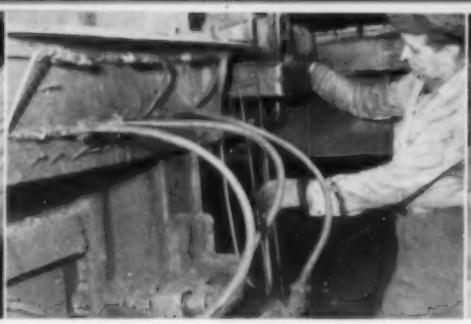
HOMER



Photo at right shows a 30" x 42" Homer Magnetic Pulley cobbing a mixture of iron ore and rock. This Homer unit is handling 110 net tons/hr., at a belt speed of 300 ft./min. Iron ore content is approximately 40%, with rock sizes from 3" x 6" down to fines.



Here's the heart of the Alemite Centralized Lubrication System at Hazleton. From this one 400-pound refinery drum, fresh lubricant is pumped direct to every bearing in the entire fifteen story plant. The results in time saved are amazing!



Note the automatic control linked directly to the machine. On these shaker bearings, lubricant is applied every five minutes while plant is in operation. Lubricant is protected all the way from barrel to bearing—no grit or dust in bearings!



Where the need for lubrication is not as extreme, as on these crusher bearings, automatic operation is not needed. The oiler simply turns a valve and the proper amount of lubricant is applied. Just one grease man handles the entire plant!

HOW ALEMITE CENTRALIZED LUBRICATION *adds $30 a day to profits!*



Protects hard working bearings at the Hazleton Shaft Colliery— Saves money... man power... maintenance!

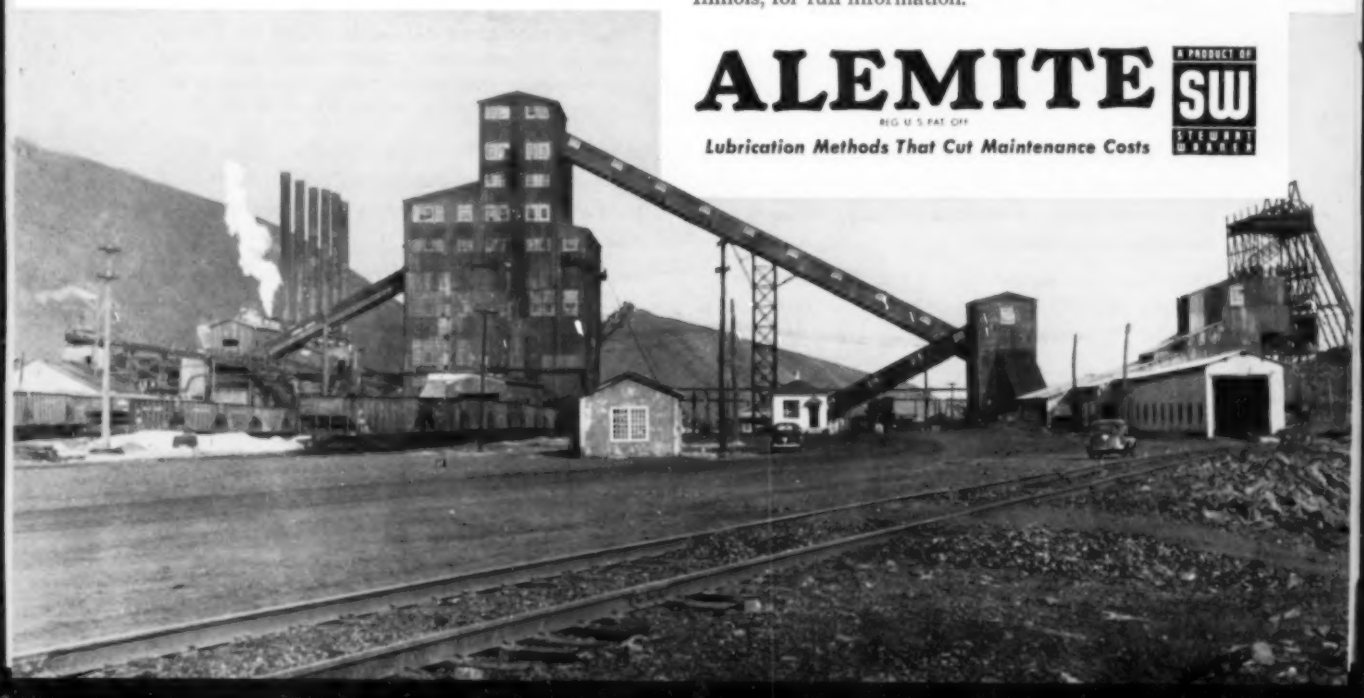
When the LeHigh Valley Coal Company installed Alemite Centralized Lubrication in their Hazleton Shaft Colliery, the immediate saving was *$30 a day* in maintenance costs! Even more important than this direct saving is the extended bearing life despite extremes of hot and cold, grit, water, dust—all the hazards that are common to coal processing.

Every five minutes, bearings on hard-working shakers receive a metered shot of lubricant—automatically! Crusher bearings are lubricated every hour. Every bearing in the fifteen story plant is lubricated—on schedule—from one central point—without shutting down a single machine! Downtime for lubrication is completely eliminated!

Throughout the coal industry Alemite has an impressive record of savings effected in labor, maintenance, downtime—plus increased tonnage. Find out how Alemite can solve your toughest lubrication problems—save you money! Write Alemite, Dept. E-34, 1850 Diversey Parkway, Chicago 14, Illinois, for full information.

ALEMITE
REG U S PAT OFF
Lubrication Methods That Cut Maintenance Costs

A PRODUCT OF SW STEWART WARNER



CLEAN PLANTS AND CLEAN COAL



BOTH PAY DIVIDENDS!

ROTO-CLONE Dust Control installed in 3 out of 7 recent preparation plants with capacity of 1000 tons or more per hour

Cleaning coal as a means of improving both product quality and sales is today accepted practice. Now, progressive operators are taking the next logical step—cleaning up the preparation plant itself through ROTO-CLONE Dust Control.

Every major dust source—conveyor transfers, picking tables, breakers, screens, car and skip hoist dumping—gets the "treatment". Dust from each operation is confined and collected by a Type N ROTO-CLONE—a high efficiency hydro-static precipitator which cleans the air by the combined action of centrifugal force and a thorough intermixing of water and dust-laden air.

Final result—a preparation plant where cleanliness matches that of any modern industrial plant, equipment maintenance is reduced and neighborhood dust nuisances are eliminated.

Dust-free material handling is available to any preparation plant regardless of size. ROTO-CLONE equipment is not expensive and a wide range of sizes permits its application to even the small, isolated dust producing operation.

Type N ROTO-CLONE designed for sluicing the collected coal dust to disposal point. Cutaway shows dual impellers and distinctive water curtains created by air flow. Highest efficiency is maintained without aid of moving parts.

For complete product information, call your local AAF representative, or write direct.

AAF

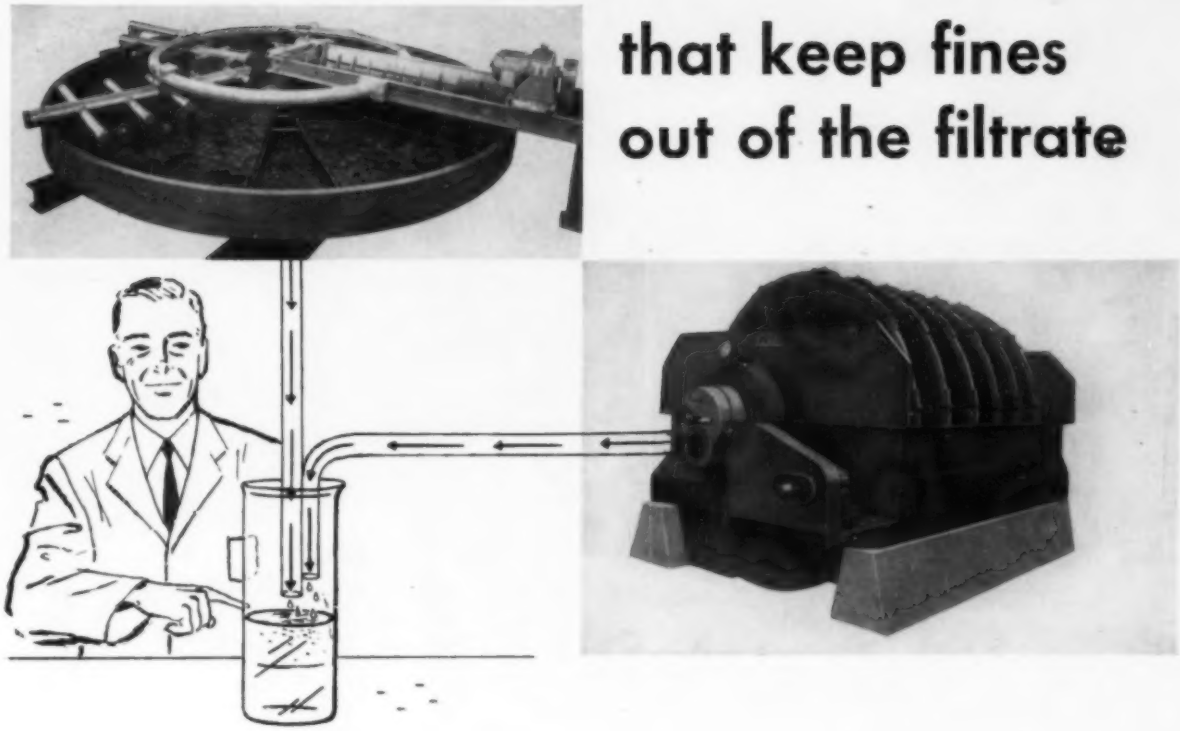
American Air Filter

COMPANY, INC.

267 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

Coal Dewaterers...

that keep fines out of the filtrate



Do you want to re-use the wash water coming from your coal preparation plant? Then, fines 'build up' becomes a problem, including the added maintenance burden on the recirculating pumps resulting from excessive solids.

The answer is simple. Install a dewaterer that retains the fines . . . that delivers a re-usable filtrate carrying less than 1% solids, a manageable quantity . . . install either the Oliver Horizontal Filter or the American Disc Type Filter or both as a team with a classifier to separate coarse from fines in the feed. Both of these filters are excellent dewaterers with exceptionally high capacity. Because they separate solids from liquids by means of a filter cloth, they produce practically clear filtrate.

We have made a thorough study of coal dewatering problems . . . have made countless tests . . . and have operating data from numerous installations to show what can be done in the way of taking coal fines out of the plant effluent, leaving it so clear that it is completely re-usable. Why not let Oliver United Engineers make a study of your 'fines-handling' problem?

WORLD WIDE SALES, SERVICE AND MANUFACTURING FACILITIES

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FACTORIES:
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Dust Control Economy
. . . for your preparation plant

BROWN-FAYRO *Cold Oil* SPRAY SYSTEM

Atomizes "cold oil" by high pressure! Eliminates oil pre-heating costs!



Brown-Fayro "cold oil" Spray System answers the need for economically and permanently eliminating the dust problem. Coal surfaces are sealed . . . dust particles are gathered into oil-bonded pellets by this system which features a high pressure pump and impact type nozzles. Additional costs of a "hot oil" system are eliminated!

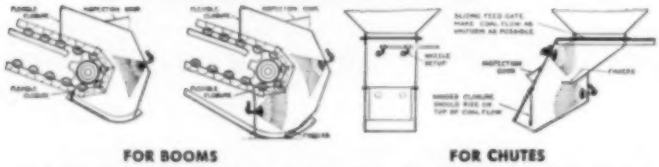
Designed to keep conditions uniform at the spray points, the Brown-Fayro system assures an even distribution of properly atomized oil over the material surfaces. For efficient, low cost dust control, specify Brown-Fayro "cold oil" Spray Systems!

CAPACITIES

CAPACITIES: Brown-Fayro Spray System pump unit when working at a pressure of 400 p.s.i. gauge, handling oil of a viscosity of 100 sec. Saybolt at 100°F.

HP	POWER	R.P.M.	G.P.H.
3	25 Cy. AC	710	425
3	60 Cy. AC	870	520
5	60 Cy. AC	1160	695
5	25 Cy. AC	1435	860
7½	60 Cy. AC	1750	1050

TYPICAL SPRAY POINT ENCLOSURES FOR BROWN-FAYRO SYSTEMS



FOR BOOMS

When spraying at the end of a boom, a plow is used on one or both sides to concentrate the coal and avoid waste of oil. Spray can be directed either at top or at top and bottom.

FOR CHUTES

Spray fog should be directed at a point where the coal is falling or agitated. At this point, chute should be carefully enclosed in light gauge steel to prevent waste of oil.

Write today for complete information.

THE BROWN-FAYRO COMPANY

JOHNSTOWN, PA.

Screen Plate, Sheet (Cont'd)

PERFORATED

Chicago Perforating Co., 2445 24th P. Chicago 5, Ill.

Harrington & King Perforating Co., 5629 Fillmore St., Chicago 44, Ill.

Hendrick Mfg. Co., 76 Dundaff St., Carbondale, Pa. (ADV., pg 155)

Kanawha Mfg. Co., Box 1786, Charleston, W. Va. (ADV., pg 95)

Laubenstein Mfg. Co., 422 S. Third St., Ashland, Pa.

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Remaly Mfg. Co., Cedar St., Tamaqua, Pa. (ADV., pg 160)

Screens

CENTRIFUGAL

Nordberg Mfg. Co., 3073 S. Chase Ave., Milwaukee 7, Wis. (ADV., pg 109)

SHAKER

Continental Gin Co., 4500 Fifth Ave., S., Birmingham, Ala. (ADV., pg 129)

Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

Helmick Foundry-Machine Co., Fairmont, W. Va.

Hendrick Mfg. Co., 76 Dundaff St., Carbondale, Pa. (ADV., pg 155)

Robt. Holmes & Bros., Inc., 520 Junction Ave., Danville 1, Ill. (ADV., pg 85)

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Kanawha Mfg. Co., Box 1786, Charleston, W. Va. (ADV., pg 95)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Webster Mfg. Co., Tiffin, Ohio

Wilmot Engineering Co., Markle Bank Bldg., Hazleton, Pa. (ADV., pg 91)

VIBRATING

Allis-Chalmers Mfg. Co., 888 S. 70th St., Milwaukee 1, Wis. (ADV., pg 101, 123, 164)

Bonded Scale & Machine Co., 2176 S. Third St., Columbus 7, Ohio

Continental Gin Co., 4500 Fifth Ave., S., Birmingham, Ala. (ADV., pg 129)

Deister Concentrator Co., 929 Glasgow Ave., Ft. Wayne 1, Ind.

Deister Machine Co., 1933 E. Wayne St., Ft. Wayne 4, Ind. (ADV., pg 160)

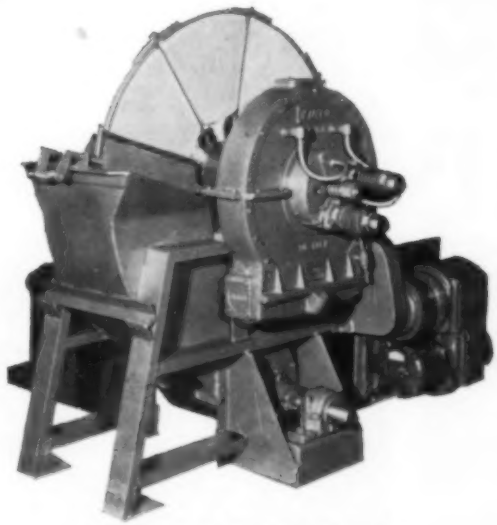
Heyl & Patterson, Inc., 55 Ft. Pitt Blvd., Pittsburgh 22, Pa. (ADV., pg 86-87)

Hewitt-Robins, Inc., Robins Conveyors Div., 270 Passaic Ave., Passaic, N. J. (ADV., pg 18-19)

Robt. Holmes & Bros. Inc., 520 Junction Ave., Danville 1, Ill. (ADV., pg 85)



Economical Coal Fines Recovery on Eimco Agidiscs



This 22 sq. ft. Agidisc filter unit available for pilot or test work in your own plant.

Eimco Agidisc filters will dewater more coal fines per square foot of filter area per hour because:

1. The gentle agitation keeps the fast settling particles in suspension.
2. Even dispersion of particles over disc surface provides uniform drying of cake.
3. Even cake formation prevents vacuum leaks and provides better cake drying over entire surface.

These features mean greater savings to every operator. Filtrate from the Eimco Agidisc varies in clarity with regard to plan, location and process, but in most cases the filtrate may be returned directly to the stream and is well within the requirements of existing anti-pollution laws.

Ein co Agidisc units provide the greatest percentage of economically retrievable coals for the smallest amount of capital investment.

Write for more complete information to The Eimco Corporation, Box 300, Salt Lake City 10, Utah.

THE EIMCO CORPORATION

Export Offices: Eimco Bldg., 52 South St., New York City • Salt Lake City, Utah—U.S.A.

824

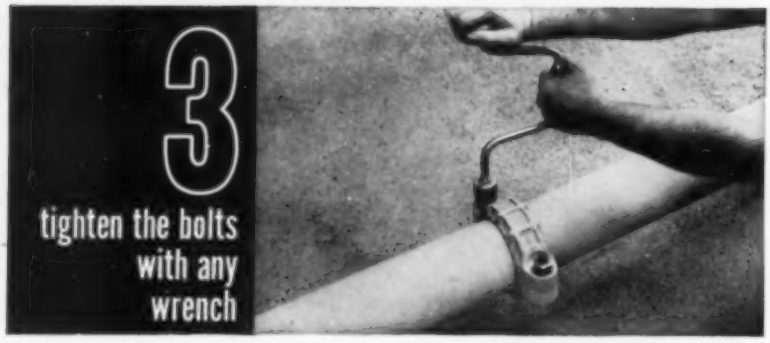
You Can't Beat An Eimco



It's as easy as 1-2-3



to couple grooved pipe with



GRUVAGRIPS

Three simple steps; that's all there is to it! And rugged re-usable GRUVAGRIPS are just as easy to remove. They're made in ¾" to 14" sizes. Next time you're at the supply store, ask the man to show you GRUVAGRIPS and GRUVAGRIP FITTINGS. (For plain end pipe, ask for ROLAGRIPS couplings.)

Write today for your free copy of the new eight page, two color G-B pipe coupling products folder. It illustrates and fully describes methods that save you time and money. Ask for folder GCF7-53.

GUSTIN-BACON MANUFACTURING CO.

210 WEST 10TH STREET KANSAS CITY 6, MISSOURI

Vibrating Screens (Cont'd)

Iowa Mfg. Co., 916 N. 16th St., N. E., Cedar Rapids, Iowa.

Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

Kennedy-Van Saun Mfg. & Engr. Co., 2 Park Ave., New York 16, N. Y.

Klockner-Humboldt-Deutz AG, Koln, Germany (ADV., pg 120)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Lippman Engineering Works, 4602 W. Mitchell St., Milwaukee 14, Wis.

McLanahan & Stone Corp., Hollidaysburg, Pa. (ADV., pg 99)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Nordberg Mfg. Co., 3073 S. Chase Ave., Milwaukee 7, Wis. (ADV., pg 109)

Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn.

Productive Equipment Corp., 2926 W. Lake St., Chicago 12, Ill.

Screen Equipment Co., Buffalo 25, N. Y. ADV., pg 108)

Simplicity Engineering Co., Durand, Mich.

Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

Syntron Co., 408 Lexington, Homer City, Pa.

N. V. Tema, 1 Nassaulaan, 'S-Gravenhage, Holland

W. S. Tyler Co., 3615 Superior Ave., Cleveland 14, Ohio (ADV., pg 147)

Universal Engineering Corp., 625 C. Ave., N. W., Cedar Rapids, Iowa

Universal Vibrating Screen Co., Deane Blvd. & St. Paul R.R., Racine, Wis. (ADV., pg 162)

Sheaves—See Power Transmission

Speed Reducers—See Power Transmission

Spray Nozzles

Bete Fog Nozzle, Inc., 85 Pierce St., Greenfield, Mass.

Brown-Fayro Co., 940 Ash St., Johnstown, Pa. (ADV., pg 144)

Deister Concentrator Co., 935 Glasgow Ave., Ft. Wayne 1, Ind.

Deister Machine Co., 1933 E. Wayne St., Ft. Wayne 4, Ind. (ADV., pg 160)

Iowa Mfg. Co., 916 16th St., N.E., Cedar Rapids, Iowa.

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Spray Engineering Co., 114 Central St., Somerville 45, Mass.

Sprockets—See Power Transmission

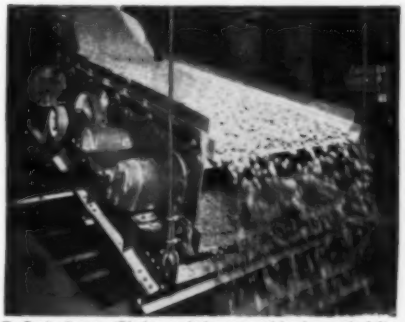
THE W. S. TYLER COMPANY

3615 SUPERIOR AVENUE · CLEVELAND 14, OHIO

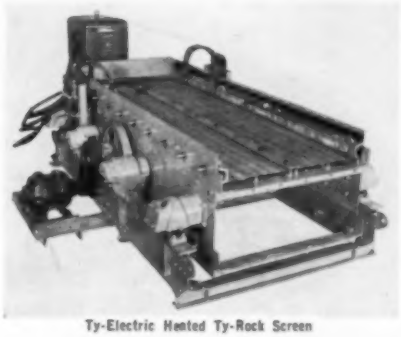
New York 17, N. Y. 247 Park Ave. | Pittsburgh 32, Pa. 5506 Fifth Ave. | Chicago 2, Ill. 6 No. Michigan Ave. | Boston 16, Mass. 20 Providence St. | Philadelphia 7, Pa. Lincoln-Liberty Bldg.

Atlanta 3, Ga. Hurt Building | Dallas 1, Texas Mercantile Bank Bldg. | San Francisco 5, Calif. 215 Market St. | Los Angeles 57, Calif. 2404 W. Seventh St.

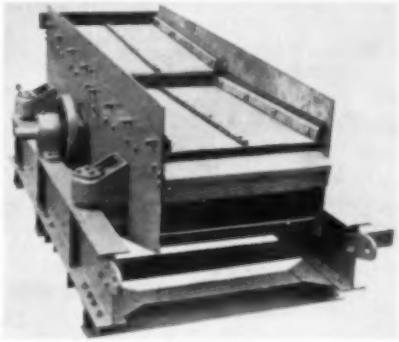
Canadian Plant & Office—St. Catharines, Ontario



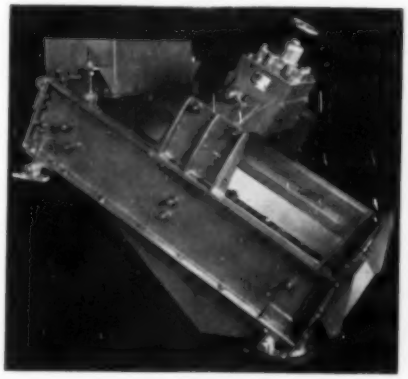
Ty-Rock Screen (Discharge chutes removed to show material)



Ty-Electric Heated Ty-Rock Screen



Tyler-Niagara Screen



Hum-mer Screen

WOVEN WIRE SCREENS

Supplied in all meshes and metals and for all purposes. Tyler Woven Wire Screen is noted for its accuracy and dependability. More than 7,000 specifications are manufactured, many of which are kept in stock ready for immediate shipment.

Write for Catalog 74, Specification Tables of Tyler Woven Wire Screens.

TY-ROCK SCREENS

This full-floating circle-throw screen combines immense capacity with low operating costs—especially for coarse and medium sizing. This is the ideal screen wherever huge tonnages of coal is handled and where flat or low angle screening is desired. Send for Catalogue 65.

TYLER-NIAGARA SCREENS

High-speed circle-throw screens for economical screening of coal products. Send for Catalogue 64.

TY-ELECTRIC HEATED SCREENS

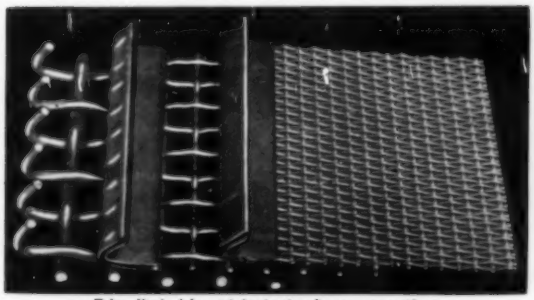
The Ty-Electric System of electric heating of Ty-Rock & Hum-mer Screens represents the most recent development in screening damp materials. The woven-wire screens are heated by passing electric current through the wires. Heat keeps the surface of the wire dry so that fine damp particles will not stick on the wires and blind the openings. Send us details of your damp screening problems so we can make recommendations.

TYLER HUM-MER SCREENS

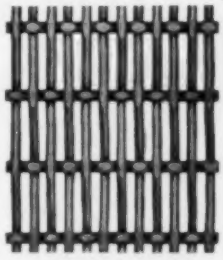
The Hum-mer was the first electrically vibrated screen and is still, by far, the lowest in operating cost for accurate sizing of medium and fine material. The Hum-mer employs less than one H.P. per vibrator and is furnished in one, two or three deck units in both open and closed models. Send for Catalogue 63.

TYLER TESTING SIEVES AND TESTING SIEVE SHAKERS

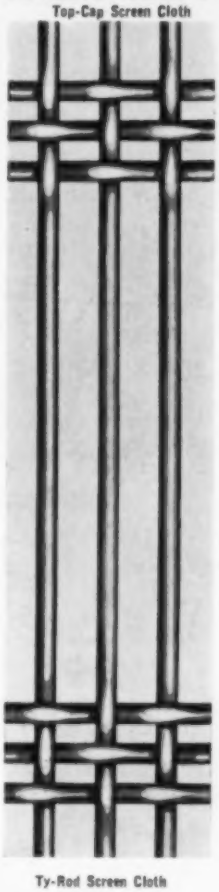
Tyler Standard Screen Scale Testing Sieves are the accepted standard for sieve testing throughout the world. The Ro-Tap Testing Sieve Shaker and the Ty-Lab Tester assure comparable, accurate data. Send for Catalogue 53.



Tyler Hook-strip and bent edge for screen sections



Top-Cap Screen Cloth



Ty-Rod Screen Cloth



Ro-Tap Testing Sieve Shaker with Tyler Sieves

THE HEART
of your preparation plant

Successful coal cleaning oftentimes depends upon the proper type of crushing of raw coal, middlings, and refuse. Your crushing equipment is not an auxiliary but is the heart of your preparation plant.

Pennsylvania has specialized in this field and has developed a dependable and accurate method of crusher selection, along with a line of Bradford Breakers, Bradmills, Hammermills, Ring Hammermills, Impactors, Jaws and Single Rolls.

Our engineers welcome the opportunity of working with you on any coal cleaning or sizing problems you have.

Ask us to send you our new catalog of crushers for the coal mining industry, Bulletin No. 4010. Pennsylvania Crusher Company (division of Bath Iron Works, Inc.) 1711 Liberty Trust Bldg., Philadelphia 7, Pa.

PENNSYLVANIA CRUSHERS

Bradford Breakers
Bradford Hammermills
Bradmills
Reversible Hammermills
Non Reversible Hammermills
Ring Hammermills
Dixie Hammermills
Dixie Non Clog Hammermills
Single Rolls
Reversible Impactors
Kue-Ken Jaws
Kue-Ken Gyracones

Storage & Reclamation Equipment

(For trucks, see Refuse Disposal)

BULLDOZERS

Baker Mfg. Co., 532 Stanford Ave., Springfield, Ill. (ADV., pg 214)
Bucyrus-Erie Co., S. Milwaukee, Wis. (ADV., pg 43)
Drott Mfg. Co., 3841 W. Wisconsin Ave., Milwaukee, Wis.
Gar Wood Industries, Inc., Findlay Div., Wayne, Mich.
Heil Co., 3000 W. Montana Ave., Milwaukee 1, Wis.
Hyster Co., 2965 N. E. Clackamas St., Portland 8, Ore.
LeTourneau-Westinghouse Corp., Peoria, Ill.
Wooldridge Mfg. Co., Sunnyvale, Calif.

CONVEYORS, STACKERS

Atlas Conveyor Co., Appleton, Wis.
Barber-Greene Co., Aurora, Ill. (ADV., pg 126)
A. B. Farquhar Co., 225 Duke St., York, Pa.
Jeffrey Mfg. Co., 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)
Frank Kremser & Sons, Inc., 3435 N. 5th St., Philadelphia 40, Pa.
Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)
Lippman Engineering Works, 4603 W. Mitchell St., Milwaukee, Wis.
Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn.
Stephens-Adamson Mfg. Co., 25 Ridgeway Ave., Aurora, Ill.

TRACTORS & BULLDOZERS

Allis-Chalmers Mfg. Co., Tractor Div., Milwaukee 1, Wis. (ADV., pg 8-9, 34)
Caterpillar Tractor Co., Peoria 8, Ill. (ADV., insert fol. pg 204)
Eimco Corp., 634 S. 4th West St., Salt Lake City 10, Utah (ADV., pg 145)
International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 239, insert fol. pg 36)
LeTourneau-Westinghouse Corp., Peoria, Ill.
Oliver Corp., 400 W. Madison St., Chicago 6, Ill.

TRACTOR LOADERS & SHOVELS

Allis-Chalmers Mfg. Co., Tractor Div., Milwaukee 1, Wis. (ADV., pg 8-9, 34)
Athey Products Corp., 3631 W. 65th St., Chicago 38, Ill. (ADV., pg 236-237)
Baker-Lull Mfg. Co., 314 W. 90th St., Minneapolis, Minn.
Bucyrus-Erie Co., S. Milwaukee, Wis. (ADV., pg 43)
Clark Equipment Co., Const. Machinery Div., Benton Harbor, Mich.

Continued on pg 154

NEW CHEVROLET TRUCKS

do more work per *day* . . . more work per *dollar* on every type of hauling or delivery job!



Time and money are the two most important factors in any trucking job—and the new Chevrolet trucks for '54 are built to save more of *both!*

THEY SAVE YOU TIME *ALL THE TIME*

Whether you deliver door-to-door or haul state-to-state, new Chevrolet trucks will speed up your schedules. They bring you new hour-saving engine power—greatly increased acceleration and hill-climbing ability. You save time with greater safety . . . and *without* increasing your maximum road speeds. In traffic or on delivery routes, new truck Hydra-Matic transmission* saves time, and saves driving effort as well. It's the last word in no-shift truck driving.

THEY SAVE YOU MONEY IN *EVERY* WAY

Along with increased power, these great new trucks bring you increased operating economy. You enjoy hefty gasoline savings in every model, thanks to new high-compression performance. In addition, you save on upkeep and maintenance. That's because you get extra strength and stamina in drive line and chassis. There are heavier axle shafts in 2-ton models, newly designed clutches and stronger frames in all models.

See your Chevrolet dealer for all the facts about the "savingest" Chevrolet Advance-Design trucks ever built! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

MOST TRUSTWORTHY TRUCKS ON ANY JOB! CHEVROLET

CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

THREE GREAT ENGINES—The new "Jobmaster 261" engine* for extra heavy hauling. The "Thriftmaster 235" or "Loadmaster 235" for light-, medium- and heavy-duty hauling. **NEW TRUCK HYDRA-MATIC TRANSMISSION***—offered on ½-, ¾- and 1-ton models. Heavy-Duty **SYNCHRO-MESH TRANSMISSION**—for fast, smooth shifting. **DIAPHRAGM SPRING CLUTCH**—improved-action engagement. **HYPOID REAR AXLE**—for longer life on all models. **TORQUE-ACTION BRAKES**—on all wheels on light- and medium-duty models. **TWIN-ACTION REAR WHEEL BRAKES**—on heavy-duty models. **DUAL-SHOE PARKING BRAKE**—greater holding ability on heavy-duty models. **NEW RIDE CONTROL SEAT***—eliminates backrubbing. **NEW, LARGER UNIT-DESIGNED PICKUP AND PLATFORM STAKE BODIES**—give increased load space. **COMFORTMASTER CAB**—offers greater comfort, convenience and safety. **PANORAMIC WINDSHIELD**—for increased driver vision. **WIDE-BASE WHEELS**—for increased tire mileage. **BALL-GEAR STEERING**—easier, safer handling. **ADVANCE-DESIGN STYLING**—rugged, handsome appearance.

**Optional at extra cost. Ride Control Seat is available on all cab models, "Jobmaster 261" engine on 2-ton models, truck Hydra-Matic transmission on ½-, ¾- and 1-ton models.*



PROPER *Pump Selection* PAYS!

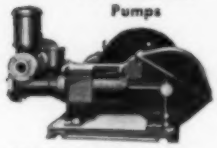


Vertical Turbine Pumps



Side Suction Centrifugals

Selecting the right pump for the job raises efficiency and lowers costs. Deming Bulletin 1000-A can help guide you to the type, size and capacity of pump most suitable for specific conditions. The complete line of Deming Mine Pumps includes the widely used "Oil-Rite" double-acting power piston pumps, various types of centrifugal mine pumps, and vertical turbine pumps in a wide range of sizes and capacities. Write for a free copy of Bulletin 1000-A today.



"Oil-Rite" Double-Acting Piston Pumps



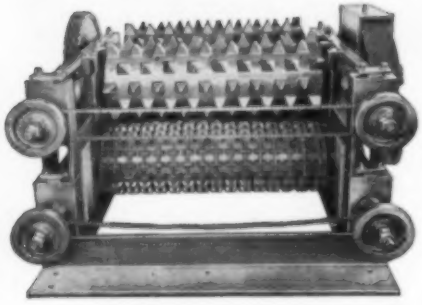
Double-Suction Split-Case Centrifugals



Self-Priming Centrifugals

DEMING *Mine* PUMPS

THE DEMING COMPANY • 533 BROADWAY • SALEM, OHIO



CRUSHERS

designed for **LESS**
- FINES
- OVERSIZE
- MAINTENANCE
- POWER REQUIRED

designed to deliver **MORE**
- TONNAGE
- SALEABLE COAL
- PROFIT

Upon your request—our mobile demonstrator will visit your mine.

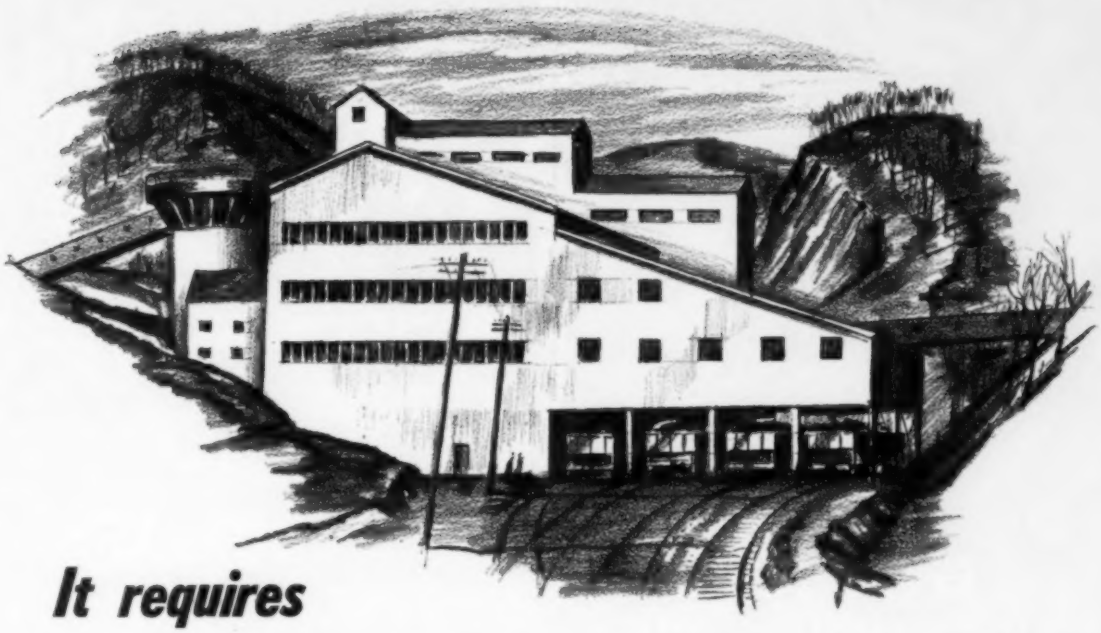
STYLE NO		CAPACITY TONS PER HOUR
1	SINGLE STAGE	60-350
2	TWO STAGE — SINGLE ADJUSTMENT	60-350
3	TWO STAGE — DOUBLE ADJUSTMENT	60-350
4	BREAKERS	100-500
	FEED RANGE	TOP SIZE OUTPUT
1	2" TOP	⅝" to 1½"
4	30"	4" to 8"
	HOPPER SIZE	
1	12"x16" — 25" — 34" — 54"	2" to 4"
2	Hopper opening varies with size crusher for tonnage required.	⅜" to 6"
3		4" to 8"

WRITE, WIRE, PHONE FOR COMPLETE INFORMATION

T. J. GUNDLACH MACHINE CO.

226 CENTREVILLE • BELLEVILLE, ILL. • PHONE BELLEVILLE 7208

REPRESENTATIVE TERRITORIES AVAILABLE



It requires

SPECIALISTS *to* ELECTRIFY

the Modern Coal Preparation Plant

• West Virginia Electric Corporation has specialized in the complete electrification of Coal Preparation Plants for more than a decade. Their operations cover the entire coal producing industry, and their specialized experience assures dependable functioning of all electrical equipment in your plant.

This service includes engineered wiring diagrams, complete wiring of the plant by skilled technicians, installation of panelboards as required, and specification and installation of electric and electronic controls.

Here's an organization which has grown up with the modernization of coal cleaning and preparation plants; a company whose wide experience and knowledge of the needs of modern preparation plant operation enable them to do a better job faster.

You can be sure that your plant will be properly wired, that controls are correctly installed and that the entire electrical system has been engineered to give the efficiency and trouble-free service you have a right to expect.

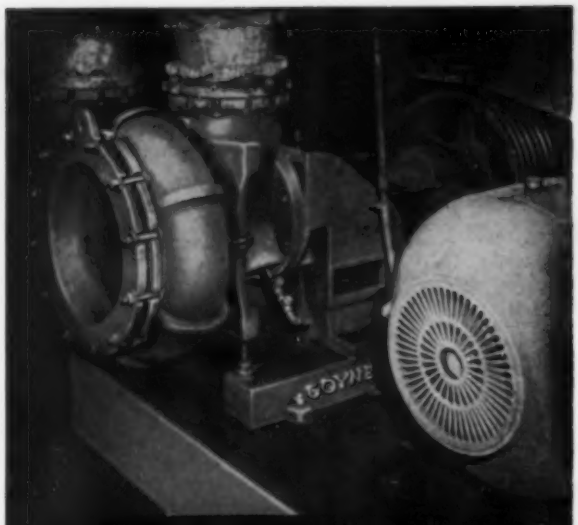
Consult West Virginia Electric Corp. on your electrical problems and for electrification of your cleaning and preparation plants.

We can direct you to any number of preparation plants whose electrification was completely handled by us.

WEST VIRGINIA ELECTRIC CORPORATION

Contractors and Designers of Electrical Systems for Coal Preparation Plants

FAIRMONT, WEST VIRGINIA



GOYNE
SOLIDS HANDLING PUMP

Feature:
LOW-COST OPERATION

GOYNE SOLIDS HANDLING PUMPS are extremely popular with a very large number of coal companies who find them quite reliable for pumping:

Liquids with solids added to increase specific gravities for coal and refuse separation in coal preparation plants.

Disposing of refuse and silt by pumping to waste material banks or for back filling into mined out areas.

Pumping prepared coal to temporarily desired storage areas.

These specially designed Goyne pumps incorporate numerous features to reduce upkeep and labor maintenance costs to a minimum:

1. Ease of inspection of all wearing parts. All internal portions are immediately accessible after removing ***only the rear head of the pump.*** No suction or discharge piping or any other major part of the pump is disturbed.

2. The only packing box of the pump is subjected to the low suction pressure rather than to the discharge pressure developed by the pump. This feature assures long packing and shaft sleeve life.

3. Impeller clearance is adjusted while the pump is running, insuring constant pump capacity so essential for uniform washing.

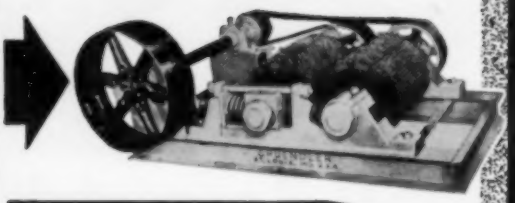
4. There are twenty-eight possible nozzle assembly combinations for each standard pump. Washery designers like this "adaptability feature" as it helps them out of tight places and simplifies piping.

5. Spare parts are carried in stock at our plant for prompt shipment. Reduce your inventory by using Goyne Process Pumps.

All inquiries are given a thorough engineering analysis and our prompt attention.

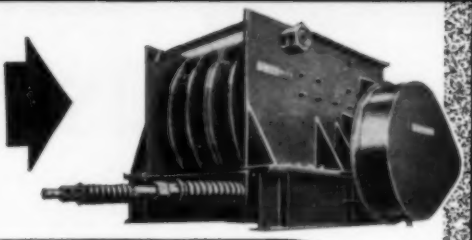
The GOYNE STEAM PUMP CO.
ASHLAND, PA.

GRUENDLER



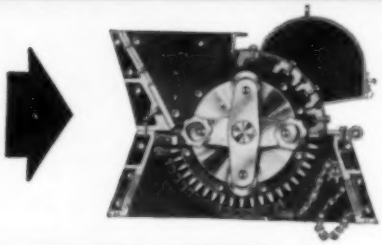
Double Roll Crusher (hopper and cover removed to show cone type teeth). For domestic secondary crushing in the 1" to ⅜" range. Produces minimum fines and dust.

COAL CRUSHERS



Single Roll Crusher. Heavy duty, roller bearing constructions. For ROM and strip mine coal and as preparation for further reduction and gradation.

FOR ECONOMICAL CRUSHING

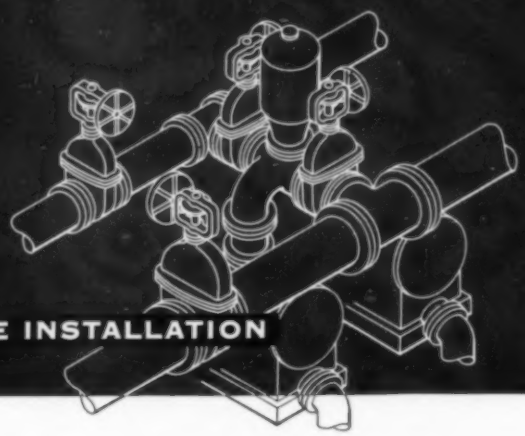


Ring Hammermill. Large capacity and great uniformity. For ROM or secondary crushing of lump, egg, and stoker sizes.

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These Valves Stay on Job After 50 Years of Water Service



THE INSTALLATION

At the Beaumont City Water Works, Beaumont, Texas, with Crane gear-operated iron body gate valves in main lines in pumping plant.

VALVE SERVICE RATINGS

SUITABILITY:	*Always reliable*
FEATURES:	*Rugged design in every part*
MAINTENANCE COST:	*Routine care only*
SERVICE LIFE:	*Still in service—since 1903*
OPERATING RESULTS:	*No valve failures*
AVAILABILITY:	*Crane Catalog item—Current No. 461*

THE CASE HISTORY

Beaumont taxpayers are still benefiting by the valve quality specified for the Municipal Pumping Station built in 1903. These 14, 16, and 24-inch Crane iron body gate valves remained in their original location until the old plant was converted recently from steam to diesel power. Even then, many were merely cleaned up and put right back in service in the new plant.

For 50 years and more, these Crane valves have given outstanding service at the lowest possible maintenance cost. With but routine care, they remained tight at seat and stem, and always performed with smooth, positive action, despite infrequent operation.

Here's an example of the quality that traditionally sets Crane apart from ordinary valves. It's value like this that has always made Crane the first choice of thrifty buyers in every industry.

THE VALVE



Today's Crane 125-Pound Iron Body Gate Valves with wedge disc are building equally outstanding service records. Highly engineered for durability and dependability at low cost, these valves are now available in the most complete line of patterns and sizes, with a choice of trim for water utilities and other services. Choose to your exact needs from your Crane Catalog, or see your Crane Representative.

THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

CRANE VALVES

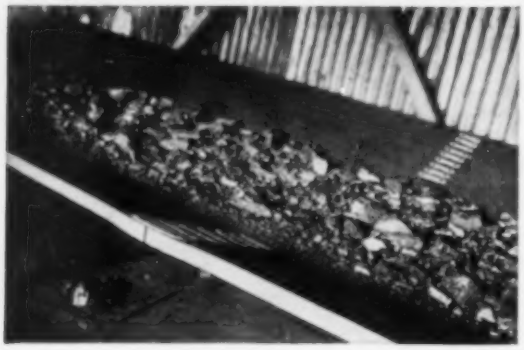


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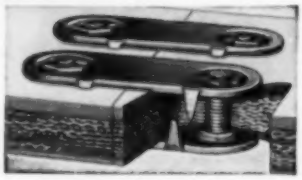
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Compression Grip distributes strain over whole plate area

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In the photograph you see how the diagonal-ended staves of a Neff & Fry Storage Bin are laid up. They are grooved and beaded to lock together. Each course is encircled with as many galvanized steel rods as needed to withstand the thrust of the load.

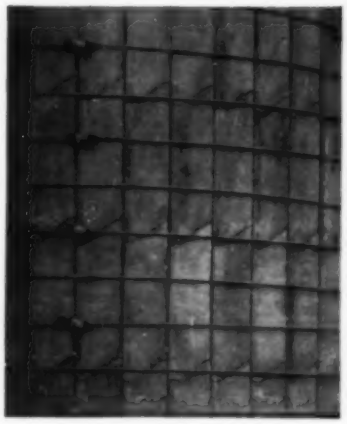
Our bins (often termed silos or tanks) are used by scores of America's leading companies for handling more than 80 kinds of flowable bulk materials; notably, cement, coal, clay, grain, gravel, ore, sand, wood chips.

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If you want to invest a few minutes in mighty profitable reading, ask for our folder, "Bins with the Strength of Pillars."

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Tractor-Loaders (Cont'd)

Drott Mfg. Co., 3841 W. Wisconsin Ave., Milwaukee, Wis.

Eimco Corp., 634 S. 4th West St., Salt Lake City 10, Utah (ADV., pg 145)

Frank G. Hough Co., Libertyville, Ill.

Trackson Co., 3333 Chase Ave., Milwaukee 1, Wis.

Tractomotive Corp., Deerfield, Ill.

Tables—See Air Cleaning, Picking Tables, Washers

Testing—See Coal Testing & Analysis

Thawing

Hauck Mfg. Co., 136 10th St., Brooklyn 15, N. Y.

Thickeners

Colorado Iron Works Co., 1624 17th St., Denver 2, Colo. (ADV., pg 98)

Denver Equipment Co., 1414 17th St., Denver 17, Colo.

Dorr Co., Barry Pl., Stamford, Conn. (ADV., pg 128)

Eimco Corp., Box 300, Salt Lake City 10, Utah (ADV., pg 145)

Hardinge Co., 240 Arch St., York, Pa.

Heyl & Patterson, Inc., 55 Ft. Pitt Blvd., Pittsburgh 22, Pa. (ADV., pg 86-87)

Klockner-Humboldt-Deutz AG, Koln, Germany (ADV., pg 120)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Western Machinery Co., 760 Folsom St., San Francisco 7, Calif. (ADV., pg 79)

Tramp-Iron Detection

Dings Magnetic Separator Co., 4720 W. Electric Ave., Milwaukee 46, Wis. (ADV., pg 159)

Homer Mfg. Co., Lima, Ohio (ADV., pg 140)

Radio Corp. of America, RCA Victor Div., Camden, N. J.

Stearns Magnetic, Inc., 661 S. 28th St., Milwaukee 46, Wis. (ADV., pg 131)

Tramp-Iron Removal

Dings Magnetic Separator Co., 4720 W. Electric Ave., Milwaukee 46, Wis. (ADV., pg 159)

Electric Controller & Mfg. Co., 2701 E. 79th St., Cleveland 4, Ohio

Eriez Mfg. Co., 1945 Grove St., Erie, Pa.

Homer Mfg. Co., Lima, Ohio (ADV., pg 140)

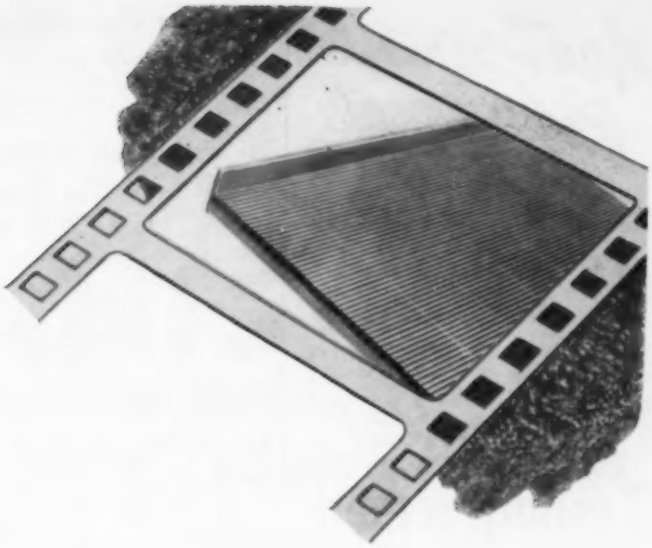
Klockner-Humboldt-Deutz AG, Koln, Germany (ADV., pg 120)

Stearns Magnetic, Inc., 661 S. 28th St., Milwaukee 46, Wis. (ADV., pg 131)

Transformers—See Electrical Equipment

Unloaders, R.R. Car—See Car Shakers

give your SCREENS a screen test



One sure way of proving screen superiority is to run water over them to test draining capacity. Nine times out of ten you'll find the screens with the best draining capacity have openings too large for profitable material retention. But this isn't true of Hendrick Wedge-Slot Screens. For Wedge-Slot Screens have very small openings yet have far greater draining and screening capacity. And they retain material that ordinarily would be wasted or cause expensive delays for reprocessing.

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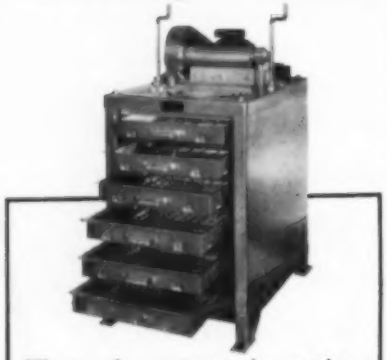


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Screen trays independently removable
Visible separation to refusal
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United States Hoffman Machinery Corp., 108 E. 12th St., New York 3, N. Y.

Valves & Fittings

COUPLINGS, SPEED TYPE

Gustin-Bacon Mfg. Co., 210 W. 10th St., Kansas City, Mo. (ADV., pg 146)

Lunkenheimer Co., Box 360 Annex Sta., Cincinnati 14, Ohio

Victaulic Co. of America, Box 509, Elizabeth, N. J. (ADV., pg 102)

RUBBER PINCH VALVES

Farris Flexible Valve Co., 400 Commercial Ave., Palisades Park, N. J.

Mine & Smelter Supply Co., 1422 17th St., Denver 17, Colo.

United States Rubber Co., 1230 Ave. of the Americas, New York 20, N. Y. (ADV., Third Cover)

VALVES

American Car & Foundry Co., 30 Church St., New York 8, N. Y. (ADV., Second Cover)

Crane Co., 836 S. Michigan Ave., Chicago 5, Ill. (ADV., pg 153)

Darling, Valve & Mfg. Co., Ft. Walnut St., Williamsport, Pa.

Fairbanks Co., 393 Lafayette St., New York 3, N. Y.

Grinnell Corp., 260 W. Exchange St., Providence, R. I.

Jenkins Bros., 100 Park Ave., New York, N. Y. (ADV., pg 201)

Kennedy Valve Mfg. Co., E. Water St., Elmira, N. Y.

Lunkenheimer Co., Waverly Ave. & Beekman St., Cincinnati 14, Ohio

M & H Valve & Fittings Co., Anniston, Ala.

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., Insert fol. pg 76)

Ohio Brass Co., Mansfield, Ohio (ADV., pg 207)

Ohio Injector Co., 275 Main St., Wadsworth, Ohio

Powell Valve Co., 2525 Spring Grove Ave., Cincinnati 22, Ohio

Walworth Co., 60 E. 42d St., New York 17, N. Y.

Stockham Valves & Fittings, Birmingham, Ala.

Variable-Speed Drives — See Power Transmission

Vibrators, Bin

Bin-Dicator Co., 13946 Kercheval Ave., Detroit 15, Mich.

Cleveland Vibrator Co., 2828 Clinton Ave., Cleveland 13, Ohio

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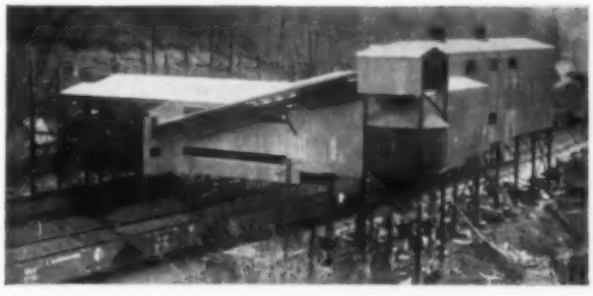
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Syntron Co., 408 Lexington, Homer City, Pa.

Wash & Change Facilities

CLOTHES BASKETS, SUSPENDED

Moore Co., 1036 Quarrier St., Charleston, W. Va. (ADV., pg 159)

WASH UNITS

Bradley Washfountain Co., 2203 W. Michigan St., Milwaukee, Wis.

Washers

(*See also Froth Flotation*)

HEAVY MEDIA, HEAVY DENSITY, DENSE MEDIA

(**Indicates prefabricated or packaged plants available*)

Chance Coal Cleaner, Mears Bldg., Scranton, Pa.

Coal & Mineral Washer Co., 239 4th Ave., Pittsburgh 22, Pa.

***Colorado Iron Works Co.,** 1624 17th St., Denver 17, Colo. (ADV., pg 98)

Daniels Co. Contractors, Inc., 26 N. 5th St., Indiana, Pa., (ADV., pg 161)

Nelson L. Davis Co., 343 S. Dearborn St., Chicago 4, Ill.

Fairmont Machinery Co., Fairmont, W. Va. (ADV., pg 82-83)

***Fuel Process Co.,** D St. at 10th St., S. Charleston, W. Va. (ADV., pg 119)

***Kanawha Mfg. Co.,** Box 1786, Charleston, W. Va. (ADV., pg 95)

Klockner-Humboldt-Deutz AG, Koln, Germany (ADV., pg 120)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Roberts & Schaefer Co., 130 N. Wells St., Chicago 4, Ill. (ADV., pg 112)

*Southwestern Engineering Co., 4800 Santa Fe Ave., Los Angeles 11, Calif.

C. Tennant & Sons Co. of N. Y., 100 Park Ave., New York, N. Y.

***Western Machinery Co.,** 760 Folsom St., San Francisco 7, Calif. (ADV. pg 79)

Wilmot Engineering Co., Markle Bank Bldg., Hazleton, Pa. (ADV., pg 91)

JIG

(**Indicates unit or packaged plants available*)

***Jeffrey Mfg. Co.,** 962 N. Fourth St., Columbus 16, Ohio (ADV., pg 10-11, 89)

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Right: New, improved Dings AHM heavy media belt type separator. Designed for easier operation, greater accessibility and simplified belt changing.

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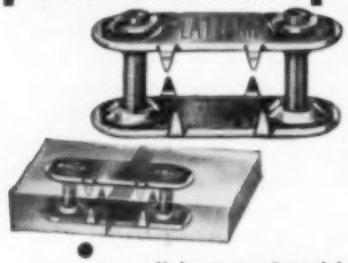
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We would appreciate your opinion on this Preparation Guidebook—an entirely new type of editorial service. Do you like it? Do you find it useful? Would you like similar sections on other subjects? Please mail the postage-free card facing pg 52 with your comments.

Washers, Jig (Cont'd)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Wilmot Engineering Co., Markle Bank Bldg., Hazleton, Pa. (ADV., pg 91)

TROUGH, LAUNDER

K. Prins & Associates, Box 46, Wellston, Ohio

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

TABLE

Deister Concentrator Co., 929 Glasgow Ave., Ft. Wayne 1, Ind.

Deister Machine Co., 1933 E. Wayne Ave., Ft. Wayne 4, Ind. (ADV., pg 160)

UPWARD-CURRENT

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. (ADV., insert fol. pg 76)

Menzies Separator Co., Farr Bldg., Scranton, Pa.

Roberts & Schaefer Co., 130 N. Wells St., Chicago 6, Ill. (ADV., pg 112)

Wilmot Engineering Co., Markle Bank Bldg., Hazleton, Pa. (ADV., pg 91)

Water Clarification, Treatment

(See also Cyclones, Thickeners)

Bulkley Dunton Processes, Inc., 295 Madison Ave., New York 17, N. Y.

Dorr Co., Barry Pl., Stamford, Conn. (ADV., pg 128)

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. (ADV., pg 81, Back Cover)

Water Neutralization

Water Neutralizing Co., Box 867, Terre Haute, Ind.

Wire & Cable—See Screen Cloth, Electrical Equipment.

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For cleaner coal . . . more efficient and economical recovery of the finer sizes. This new table offers outstanding improvements in the contour of the deck surface and the NEW *Lifetime* ANTI-FRICTION HEADMOTION, assuring quicker stratification and more positive separation between refuse and CLEAN coal.



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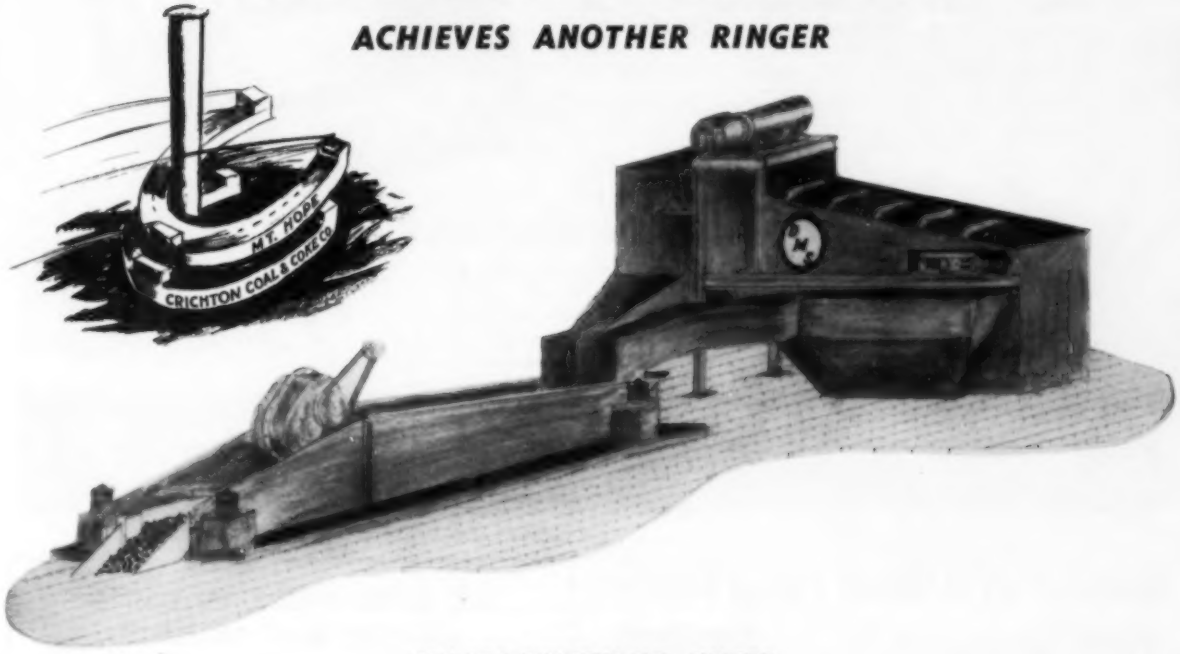
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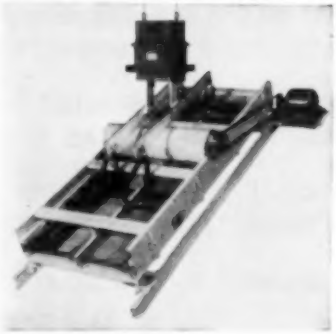


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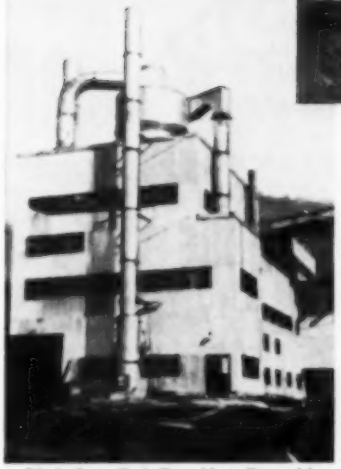
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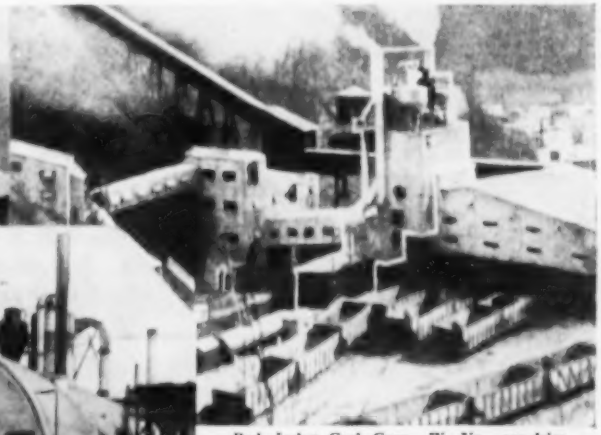
Blue Diamond Coal Co., Toner, Ky., sets record economies in drying ¼"x0 fine coal from 10% to 2% final moisture content. Single column Flash Dryer has 75 tons per hour capacity.



Clinchfield Coal Co., Dante, Va., using 3-column Raymond unit handles 180 tons per hour of ¼"x 0 coal. Moisture reduced from 12-14% down to 2%. Rated capacity greatly exceeded—smooth, clean, automatic operation—low maintenance costs.



Typical small capacity Raymond unit at Kuesel Coal Company is flash drying 15 tons per hour of fine coal to less than 3% moisture.



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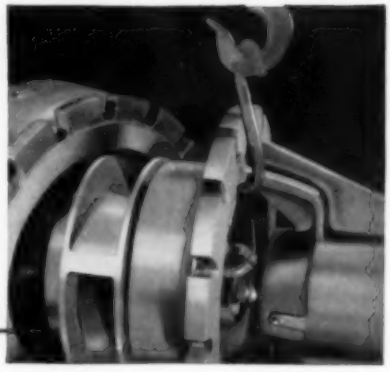
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Devoted to the Operating, Technical and Business Problems of the Coal-Mining Industry

Coal Age

MARCH, 1954

IVAN A. GIVEN, EDITOR

Strength Everywhere

AN INVESTMENT of well over half a billion dollars in new preparation facilities in the past 10 years is evidence of coal's determination to back up its cost-cutting efforts with the maximum in coal quality. How to get more out of that investment—and out of the additional expenditures to be made in the future—is the goal of a major feature in this issue of *Coal Age*: The Preparation Guidebook.

Translating cost and quality into maximum realization requires, however, a third step—efficient merchandising. What the situation is, what the needs are, and how to go about meeting those needs, is the subject of a second feature in this issue. With the best in preparation, backed up by low cost, and with a hard-hitting merchandising program set up to capitalize on the unchallenged advantages of its product, coal can lead from strength everywhere with profit to itself and more value for its customers.

Low-Coal Answer

AT WHAT POINT does thinning of the seam begin to raise mining cost significantly? And what, if anything, can be done to stave off the increase or, if it cannot be avoided, keep it to a liveable minimum?

Some increase in cost can hardly be avoided in the thinner seams. However, cost of development can be reduced by making it as near like face work as possible, and by changing plans to increase the proportion of face territory. Air and man travel can be cut by auxiliary openings. Machine methods can reduce the cost of taking top or bottom for height. And, among other things, longer haulage distances can be offset by using mediums operating with a minimum of manpower.

Manpower, in fact, is the key to the problem, and where much reliance is placed on manual methods, cost is bound to reflect the fact that working in cramped quarters cuts productivity. But properly designed equipment doesn't know whether the coal is thick or thin and, if properly designed, operates with a bare minimum of manpower. Such equipment is coming onto the market in increasing numbers and is showing, by its performance in certain mines, that it can provide tons-per-man figures equal to or better than those obtained in high coal. Everything indicates that these machines—built for the purpose and including remotely controlled units—will be the most-effective answer to the low-coal problem.

More Than Repair

ASIDE FROM the actual cost of keeping units in operating shape, the rise of machinery in mining has emphasized the importance of maintenance—and the fact that achieving the real goals is more than merely working on the machines themselves. Maintenance, in fact, starts with machine design. Design cannot prevent normal wear and stoppages but it can minimize them, and enhances the value of the on-the-job steps. A most-important one certainly is a good operator—one who will not abuse his machine and who can spot potential trouble before it builds up to a breakdown. The good operator should be backed up by a supervisor who appreciates the importance of maintenance, and by a mechanic whose main job is to forestall trouble. Rated voltage at the machine is of course vital, and so are good lubrication, regular overhaul and long-lived materials.

Prompt and economical repair and overhaul naturally are essential. Though the system varies from mine to mine, it involves checking machine condition and also proper shop facilities, equipment and manpower. But to cut the cost of repair and overhaul, and to better achieve maintenance's overall goal of continuous or near-continuous operation, the job must start long before repair comes into the picture.

Market Development Spells Sales Opportunity

• Year-end interviews with 435 consulting engineers and architects, reported in *Engineering News-Record*, Jan. 7, 1954, show that 53% of those interviewed had more work on their drawing boards scheduled for 1954 than they had a year earlier.

	Value of Projects (Million Dollars)	Per Cent Change From 1953
BY KIND OF BUILDING		
Public schools	$374.3	+37
Public housing	91.5	+35
Mass housing	186.5	+16
Commercial construction	331.9	+61
Industrial construction	207.6	— 4

• Projects listed by the 435 firms add up to $2,400,000,000. That's 27% above the figures for the same period in 1953. Projects in which coal has a direct interest as a possible market for fuel include the following:

	Value of Projects (Million Dollars)	Per Cent Change From 1953
BY REGION		
New England	95.0	+66
Middle Atlantic	1,011.0	+40
Far West	322.0	+32
Midwest	323.0	+16
South	286.0	+16
Southwest	326.0	+ 6

• In part confirming the figures above, F. W. Dodge Corp. reports that out of 1,100 school superintendents in towns over 10,000 population, 88.5% now are engaged in building new schools or expect to be so engaged in the next 3 yr. Among architects surveyed, 65% reported to Dodge that they had schools on their drawing boards in the 6 mo preceding the survey of school superintendents.

Better Selling . . .

Key to Broader Coal Markets

Better selling means greater volume, greater profit. Better selling can cash in on coal's undoubted cost and quality advantages through market research, creation of favorable sales climate and massed power.

IS MERCHANDISING the weakest link in the chain connecting the coal producer with the coal user—or potential user? In the marketplace, where the industry's profit-and-loss score is actually marked up, is coal cashing in on the really significant improvements in cost and quality flowing out of expenditures of over $2,000,000,000 in the last 10 yr or so?

Consider a few of the basic tests that show up the strength or weakness of a merchandising program:

1. Who are coal's prospects? Does the industry have the name and address of every organization and individual who might use coal? Recent attempts to find even regional lists reveal that coal lacks information even here, whereas the first step in efficient merchandising is sizing up the market—in other words, finding out who the possible customers are and how much they might buy.

2. Is coal on the scene with its story when a competitive situation arises? This involves over-all advertising and promotion to spread coal's story consumer-wide and keep spreading it day after day and year after year. Is every school-board member, for example, told coal's story often enough so that he knows coal is in the running? Equally vital, is coal on the spot when a new school is to be built or a heating plant is to be modernized? If oil and gas show up when the board is making its decision and coal doesn't, which is most likely to get the business?

3. Are equipment suppliers at least giving coal an equal chance, if not preference? Getting a possible customer to use coal nearly always involves equipment. If suppliers push oil and gas equipment and soft-pedal coal equipment, the odds are against coal. Coal therefore must make sure that equipment is available and that suppliers give it at least an even break.

4. Is coal assured an even break in engineering and consulting reports?

Does the average school architect, for example, include coal even as an alternative when he files his plans for a new school building—or for any other facility from a big manufacturing plant down to a small laundry?

5. Can a customer—or a prospect—get answers to the problems that may arise in using coal? In other words, what are his chances of getting good, johnny-on-the-spot service?

6. Do operators of industrial and commercial boiler plants get best results from the coal they use? By and large, the answer is "No," for in many of these plants, coal-burning efficiency is 10 to 20% less than it should be with the type of equipment they have. It is squarely up to the coal industry to help its customers improve this figure.

No amount of merchandising—no matter how good or how high-powered—can compensate for prices higher than those of a competitive product or for a basic inferiority in quality. By the same token, a quality product competitively priced will fail to capitalize fully on its advantages unless it is backed up by good, hard-hitting merchandising.

Though the goals are clear and easy to state, coal's problem of attaining efficiency in merchandising is not a simple one. Suppose you create the best individual company programs that can be devised within the limits of the resources of each company. Are they enough against the solid front of competition? The answer is "No." That solid front must be met by a solid front, thus creating a climate in which individual company efforts can yield benefits commensurate with the thought and effort that go into them.

What Sells Fuel Where?

Various needs and wants guide fuel users to a choice of one fuel over another. Knowing the weight that various customer groups give to each factor, coal can gear its sales approach to each group. Here is how the factors rate in three major fuel markets, plus the competitive record for 1952, the latter being a measure of coal's opportunity to win new customers.

How Customers' Wants Rank	The 1952 Record—Can Coal Increase Its Future Share?	
HOME-HEATING MARKET		
1. Convenience, comfort and cleanliness resulting from equipment available.	Bituminous to retail dealers, tons	68,393,000
2. Service.	Anthracite, commercial production, tons	39,475,000
3. Quality.	Natural gas, residential sales, coal equivalent, tons	61,000,000
4. Price.	Heating oil, No. 2 distillate, coal equivalent, tons	43,500,000
5. Dependable supply.		
COMMERCIAL AND INDUSTRIAL MARKET		
1. Dependable supply.	Bituminous, "Other Industrials," tons	95,863,000
2. Service.	Natural gas, commercial and industrial sales, coal equivalent, tons	126,700,000
3. Manpower operating costs.	Heating oil, sales to smelters, mines and manufacturing industries, coal equivalent, tons	10,000,000
4. Uniformity of quality.		
5. Price.		
ELECTRIC UTILITY MARKET		
1. Price.	Coal burned, tons	107,039,868
2. Dependable supply.	Gas burned, coal equivalent, tons	36,475,000
3. Uniformity of quality.	Oil burned, coal equivalent, tons	15,793,000
4. Service.		
5. Equipment available.		

This building of individual and industry programs involves, among other things, the following:

1. Acceptance of the philosophy that merchandising is at least as important as quality and cost in winning and holding business.

2. Action to improve present merchandising setups and create new ones—both individual and industry-wide—as necessary to follow through on the basic merchandising philosophy.

Reorientation Under Way

THE REORIENTATION IN THINKING that is a necessary prelude to overhauling of merchandising and sales methods already is under way. Witness, for instance, the views expressed by industry leaders in the February, 1954, issue of *Coal Age*, p 70. These views reflect:

Discontent with present volume of sales.

The need for fresh thinking on merchandising and sales.

Determination to sell more coal—and sell it better.

Already, also, steps are being taken to put these views into practice. Here are some of the ways in which coal is moving:

1. Market Promotion Dept., National Coal Association, is broadening its horizons. Emphasis now extends to on- and off-track commercial and small industrial markets, where tonnages are substantial and profits are rewarding.

2. Public Relations Dept., NCA, fitting its advertising and promotion to today's market conditions, is using case-history testimonials from coal users who find coal the cheapest, cleanest and best fuel.

3. After 20 yr in which few if any improvements were made in stoker design, one new automatic-ignition, bin-feed stoker, built to the design of David T. Campbell, Indianapolis, Ind., now is ready for market. Another radically new stoker is on the threshold.

4. Producers, shippers and retailers have underwritten Automatic Solid Fuels Equipment, Inc., to produce, promote and sell the new Campbell stoker and any other new equipment that may be developed.

5. Today, flying squadrons like the Minute Men of Minneapolis and St. Paul, similar groups elsewhere, and NCA-ARCA Sales-Engineering Council of Illinois, Michigan and Indiana stand ready to fight for coal at a moment's notice before school boards, city and county commissioners, hospital building committees and the officials and engineers of industrial corporations. The result: In at least some areas, fuel contracts no longer go by default to oil or gas.

6. As a selling aid for salesmen and an efficiency aid for coal users, a growing library of technical data and helps for laymen is available from coal's research and promotion agencies.

7. In major market centers, the anthracite industry has set up Anthracite Information Bureaus to keep architects and builders posted on the merits of anthracite and anthracite

burning equipment.

8. American Coal Sales Assn. is running sales clinics in market centers and will repeat the fine 2-wk university courses offered last year.

In short, leading coal producers and their agencies—anthracite and bituminous—are beginning to move in the direction A. H. ("Red") Motley urged on them when he addressed the NCA convention last fall. At that time, Mr. Motley said: "Bring to your sales and distribution the same brains, money, thought, time and effort you have put into the mechanization of mining."

But if the industry already has made a start, much yet remains to be done. Coal still needs to:

Firm up its new philosophy of merchandising and sales.

Find out what its markets are—and where they are.

Develop sales methods that will exploit the market potential.

Select, train and back up salesmen.

Merchandising for Today

CREATION OF A CLIMATE that makes fuel users want coal is the goal of merchandising. The need therefore is for something more than advertising, sales calls and the like, important as they are. The basic step is a reorientation in thinking and approach involving, among other things, these steps:

Face facts, cast off gloom and take on pride and confidence.

1. Neither oil nor gas will vanish from the marketplace in the near future. Both will keep on contending with coal.
2. Mining costs have been rising—and, with them, prices.
3. Freight rates lay a heavy burden on coal users. No relief is in sight.
4. Coal-company profits are painfully low.

Hard facts, all. But no reason to despair. For instance, it can be argued that:

- If the industry has been shaken down in the last 2 or 3 yr, it also has been tightened up. A substantial nucleus of strength remains among producers and, among customers, a solid core of preference for coal.
- If oil and gas have taken over some of coal's markets, today's coal industry produces a wide variety of quality coals, tailor-made to exacting specifications. Quality coal is a merchantable product. It will not sell itself, but it can be sold.
- If coal markets are sluggish, the energy market in the United States still is expanding. It will keep on expanding as long as more machines replace muscle in American factories, as long as people seek more comforts and services and as long as population grows. In this expanding energy market, there's an expanding market for coal.
- If mining costs have risen, there is good reason to believe that the peak is not far off, if it has not already been reached. And wider and more intensive application of proven equipment and methods—and others on the drawing boards—can cut them in the future while still providing a good profit margin and permitting the industry to support a wage level and a standard of welfare of which it can well be proud.
- Far from being ruined, the industry has firm grounds for pride and confidence.

Express that new-found pride and confidence everywhere.

Express it in advertising, sales calls, service calls, correspondence and business and personal contacts. It is an infectious attitude. Customers, catching the spirit, lean to the man who takes a confident approach to his business.

Associate value and service with coal.

Very few fuel users need coal. What they need is heat, and they can get it from coal, oil or gas. The only way to make fuel users choose coal is to merchandise coal through value and service.

Value was the theme of L. H. Vroman, general purchasing agent, Marquette Cement Mfg. Co., in an address not long ago before the American Coal Sales Association. Among other things, he said:

"Price can never be disregarded in determining value. But rather than buy on the basis of price, we would prefer—because we know we would get better value—to pick a supplier highly regarded in his industry, well located to reach our plant and represented by our kind of salesman; and then give this concern the details of our problem and tell them to start shipping."

Mr. Vroman went on to speak of service and its role in merchandising and sales. He expects the men who sell him a product to:

1. Make sure the product meets specifications and performs properly.
2. See that the methods the buyer uses give him the best results obtainable.
3. Arrange and stick to satisfactory shipping methods and schedules.
4. Learn what the buyer's problems are.
5. Muster all the resources of the supplier company to find the answer to the buyer's problems.

In other words, sales calls are not enough in today's market. Coal men also must seek out a customer's complaints, find the causes of his troubles and show him how to get good results from coal and coal-burning equipment.

Re-educate those who select, design and install heating and burning equipment and inspire their confidence in coal.

Not enough people today know the merits of modern coal. A recent survey by NCA in Toledo, for example, revealed the following facts: few architects within the past 10 yr have designed commercial or small industrial plants to burn coal and they therefore are out of touch with advances in coal utilization; engineering consultants report that their clients demand the convenience and economy of gas or oil, about which they have been propagandized, without troubling to find the facts about the economy and convenience of modern coal equipment; specialists in hospital construction ban coal because they think it is dirty, not knowing that coal is clean when properly burned; and fuel users, architects and consultants complain that labor costs are high and that qualified boiler men are hard to find.

The situation in other cities probably doesn't differ greatly from that in Toledo.

Acquainting the people who count with the merits of quality coal and good equipment is at once the great task and the great challenge to coal men. As the ACI *Bulletin* puts it, "The industry's merchandising practices represent the weakest link in the coal industry's chain. Specific improvement in this phase of the business will pay greater dividends than any other single effort that may be put forth."

What is badly needed, says NCA's Market Promotion Director J. Nelson Stuart, is "Total Selling." By that, Mr. Stuart means a drive in which everybody—coal producers, shippers and retailers; makers of burning equipment and controls; producer, wholesaler and retailer associations—learns

the merits of coal and the ways to exploit its inherent values and then joins together to broadcast the facts through all communication channels to coal customers and prospects.

Create prestige and identity for general- and special-purpose coals.

Identify various coals by brand name. Tell customers what each branded coal will do best. Advertise and promote brand names energetically. Seek seals of approval from organizations and agencies that test, measure and certify products. Consistently deliver the quality that the brand name promises and stand by all pledges and guarantees.

In all this, coal can be confident of working in a climate growing more favorable daily as a result of changes in public thinking reflected, for instance, in a rising tide of favorable editorial comment and news dispatches in the daily newspapers.

The problems are there and solving them will be no easy task. But coal also has the preceding advantages and others in its favor in a broader program. That program must start with exact knowledge of markets and prospects, then devote maximum effort to the process of manufacturing sales—a process which, step by step, moves through these five stages:

1. **Make the contact,** reaching all the men who directly or indirectly control buying.

2. **Arouse interest** in the product—coal, in this instance.

3. **Create preference** for the product.

4. **Make a specific proposal;** that is, fit the product to the prospect's needs.

5. **Close the order,** giving the patience, the resourcefulness, the ability and the time needed for the sale.

Exploring the Markets

COAL'S MARKETS HAVE SHIFTED sharply in the last few years and adjustments have been painful. The end of these adjustments and shifts is not in sight.

The railroad market, once coal's biggest, has shrunk. Retailer tonnage has thinned down. Losses among "Other Industrials" have been substantial. Overseas exports have fluctuated unpredictably. Meanwhile, electric utilities have nearly doubled their coal burn and demand from the steel industry has grown by some 50%.

Slower but equally significant changes have occurred in the sizes and specifications of coal sought by customers. Buyers for electric utilities, heeding the wants of plant engineers, have upgraded their specifications. Steel companies, facing a shortage of high-grade metallurgical coals, now are looking for coals that can be blended for blast-furnace operations. Industrial plants are asking for larger quantities of stoker sizes. And, among utilities and industrial plants, fine sizes, which producers once discarded as waste, are finding a strong market.

Meanwhile, with some kinds and qualities of coal in over-supply, intra-industry competition has sharpened, the boundaries of traditional market areas have shifted, distress sales have weakened prices and some producers have turned to water and truck transportation to reach outlets far from home base.

To many coal companies, these changes have been unwelcome, to say the least, and pleas for controlled production now are being voiced in some circles.

But the truth is, there's not too much coal being mined. There's too little being sold.

Unless coal keeps step with shifting markets, coal sales cannot grow. The crucial need is market research, including closer relations with coal customers and their needs and an unrelenting search for new prospects for coal, with an eye open for new industrial technologies in which coal may become useful. With market research, the industry can stay on top of market shifts, find out what customers want and in what direction their needs are drifting, and discover what and where the most stable and promising markets are. That way, the industry can gear production, preparation, transportation, distribution and sales to the changing opportunities of the market.

The biggest need for market research today is among coal's commercial and small industrial customers and in coal's "mystery market," the unclassified industrial users among whom coal tonnage adds up to 100,000,000 tons or more per year. Data on who these customers are, where they are and how much coal they burn is the key to intelligent sales in this field. The coal industry does not have that key today. A recent economic study prepared in the Harvard Business School stated the problem bluntly: "The coal industry is at the mercy of a market of which the operators know little and over which they have no control."

Few operators who sell to this market can take issue with that statement.

The coal industry, regionally and as a whole, can benefit greatly from systematic, up-to-the-minute data about these almost unknown customers. The needed data include the following:

Who coal's customers are, where they are and who buys coal for them.

How much coal they burn.

What they use coal for.

What they want in the fuel they buy.

What kind of burning equipment they have and how it performs.

What their complaints are.

In addition, the industry needs advance posting on:

New construction contracts, private and government.

New public building plans, including those for schools.

New apartment houses and housing projects.

New industrial plants and factories.

With these facts to go on, coal companies, shippers and salesmen can spot their markets and shift with them, help their customers use coal better, and show up, in time to tell coal's story and on an equal footing with oil and gas, when new customer-prospects appear.

Among big industrial customers and those that are destined to grow big in the future, other approaches can be helpful.

By staying close to the needs of big and new but growing coal users and by seizing opportunities created by new technologies, coal producers can increase coal's service potential and create stable and promising markets.

The Harvard coal study, referred to earlier, explains how closer relations between coal and coal-consuming industries may shape coal's course toward a better future. The study cites four current examples of the direction in which coal's future may lie:

1. Pittsburgh Consolidation Coal Co. and three steel companies have formed a unique coal company to produce coal for steel mills and for Consol. When the steel-production rate is low, Consol markets any excess of coal. And when Consol finds commercial markets sluggish, the steel companies absorb the excess. That way, the coal-producing company smooths out the peaks and valleys of production and, at the same time, serves the steel companies—a stable and profitable market—with coal that

suits their needs. In short, integration is providing benefits for both.

2. Near Charleston, W. Va., Carbide & Carbon Chemicals Co. is producing high-order aromatics by hydrogenating coal from a nearby mine. There, with a chemical company in the coal-mining business, coal output is integrated with and tailor-made for a customer that is destined to grow. Meanwhile, at Library, Pa., where Consol is working with a chemicals-from-coal pilot plant, a coal company is moving across the threshhold into the chemical industry.

3. In Milam County, Texas, Texas Power & Light Co. is nearing completion of a lignite-burning steam station that will provide electric power for a nearby plant of the Aluminum Co. of America. McAlester Fuel Co., McAlester, Okla., is mining consultant on the job. Lignite is heat-processed by methods developed by the U. S. Bureau of Mines. When the entire operation gets going full blast, it will be run in balanced integration. Char from lignite will be the boiler fuel, volatiles extracted from the lignite will become marketable chemicals, high-grade carbon will be made into electrodes for aluminum potlines and electric power will reduce alumina to aluminum.

4. A growing number of electric utilities serving areas where power demand is high and coal is abundant now are building steam stations almost on top of coal mines. The result: Low-cost, tailor-made coal and good service for the power plant and steady working time for the mine.

The four examples above are not cited to prove that more "captive" mines or absorption of coal by other industries would be good for coal. That is not the question at issue. The question is: "How can coal uncover stable, big-tonnage markets and grow with them?"

One answer to that question lies in those four examples: Close relations with big-tonnage consumers, plus up-to-date acquaintance with the technology of those consumers. Thus far, with a few notable exceptions, the initiative in creating these integrating and profitable relations has come from the consumers. The time now has come for coal companies to take the initiative by aggressively seeking out fuel-consuming operations, affiliating closely with those operations and, in a spirit of helpfulness toward consumers and self-interest for the coal industry, working with consumers to produce a coal and render a service that fills their needs.

Selling More Coal Better

TO SELL MORE COAL – AND SELL IT BETTER – the industry must provide the plus values that customers seek, get a fair price for its product and, through cooperation and individual effort, upgrade its sales program.

Selling Plus Values in Coal—Few sales are made and still fewer stick as long as supplier and customer confine their terms to tons and dollars. Instead, most customers look for value.

What are the plus values that well-established coal producers can offer with their coal? Here are a few:

Dependable supply for the long term.

Ability to meet and hold to specifications.

High quality.

Economy—with reasonably sure prospect that mining and processing developments will widen coal's already favorable price differential in the future.

Protection from the risks associated with spot purchases and spot prices.

Helpful supplier-buyer relationships.

Good transportation facilities and shipping schedules.

Engineering services available at the customer's request.

A wide range of equipment for burning coal the modern way.

A reputation for dealing with customers in good faith.

Plus values like these keep dollars and cents from being the hinge that swings a sale. With them, coal men can ask a fair price for their product without apology—indeed, with confidence of gaining a sale.

Pricing Coal Fairly—Selling coal at less than the cost of producing it actually helps nobody, nor does it add a single ton to consumption. Coal sold below cost only displaces some other coal. It weakens the producer who sells it, it hurts the competitor whose coal it displaces, it undermines prices and thus weakens the entire industry, and it lures the buyer away from a dependable supplier to a supplier who, by economic laws, can't stay in business very long. In addition, it destroys mutual respect, the root of all satisfactory supplier-buyer relationships.

The industry needs—and deserves—a fair price for its product. A coal company can obtain a fair price by showing customers that a fair price insures value and thus serves their interests best.

Putting Power Behind Sales—Concentration of sales power, backed up by massed tonnage adequate to support creative merchandising, strong advertising, an aggressive sales force and helpful service to customers, is one needed key to more and better coal sales.

It doesn't matter greatly whether such massed power is achieved through independent sales companies that market the coals of several producing companies including, in some instances, a producing company owned by the sales company; or through cooperative regional sales-and-engineering agencies supported by a number of producing companies. What does matter is that the volume of coal and the volume of sales, concentrated in one agency, be big enough to sustain the needed program.

One primary requirement for massed sales power is willingness to work as hard for the industry as for one's own company. Naturally, every producer wants his own coal to be sold. But the industry today needs more producers who, seeing no chance for their own coal under a fuel user's boiler, still are willing to pitch in and help sell somebody else's coal—more producers who act on the principle that whatever helps the industry helps the individual company also.

How can well-supported sales agencies, either independent or supported by groups of operators, help coal?

Here are some of the possibilities:

1. Provide engineering services for coal users at low cost to individual producing companies.

2. Employ skilled salesmen and engineers at salaries that their skills command.

3. Spread the cost of market research and provide useful data on demand and market trends.

4. Maintain close contact with coal users.

5. Uncover prospective customers.

6. Assure coal users that, with a wide variety of coals to choose from, their exact needs can be filled.

7. Ease the risks of overproduction and assure operators of a fair and stable price for their coal.

8. Speak for all supporting operators in issues involving coal—smoke ordinances and freight rates, for example.

Adding Power to Power—In some other industries, the technique of massed product promotion, with one industry or one company joining another, already is well established. Banks, for instance, boost the products of their aluminum customers. Chemical companies boost the products of their paper-making and packaging customers. Container makers boost the dairy products, cereals, paints and insecticides their customers produce.

Likewise, for coal there is a rich field to be cultivated by pooling effort and skill to promote the sale of end products and services provided by coal users. For instance, the massed power of an electric utility and its coal supplier, directed at the sale and use of electrical appliances and equipment, would increase power demand and, in turn, coal consumption. The same result—that is, bigger coal use—would result from coal's merging its promotional skills with those of other coal customers—textile plants, food canning and processing factories, glass plants, laundries, bakeries, brick kilns and cement mills, to mention only a few.

Making Salesmen Better

THE MAN WHO SEES THE CUSTOMER is, in the final analysis, the bridge between coal producer and coal user. However much the industry and the individual company may do to improve coal's sales position—and much, as pointed out, can be done—the salesman is the man who makes or fails to make the sale.

What makes a good salesman?

Mr. Vroman, in his address before the American Coal Sales Association, ticked off the qualifications of the men who have been most successful in selling their products to his company. Those qualifications are as follows:

1. The salesman understands his own product and those of his competitors and knows how—and whether—each fits into his customer's needs.
2. He is sold on the merits of his own product, his company and the men he works with.
3. He is confident of his ability to diagnose and solve his customers' problems.
4. He is enthusiastic and energetic.
5. He inspires confidence.
6. He knows his own limitations but, backed up by the men, the machines and the processes of his company, he calls on those resources when they are needed.

Mr. Vroman went on to tell how some salesmen, having failed for a long time to sell their product, at last won his company's business. These men, he said, kept on making calls in spite of disappointments, they always offered help and advice, they sustained their interest in their prospect's problems and his business, and they showed repeatedly that they would be proud to become a supplier.

Men with those basic qualifications are well on their way to successful salesmanship. They are, in fact, sales engineers, though that title probably would surprise most of them. They are the men who know what kinds of burning equipment and controls are on the market and how those units fit into their customers' needs and wants. They know the results of research and can translate them into benefits for coal users. They are familiar with—and use—all the sales aids available from their company and from the industry's research and merchandising agencies. They get into the boiler room of their customer and, if they cannot solve the problems they meet there, they know when to call in trained technical men.

Those are the kind of salesmen coal needs today. There are not now enough of them. The outlook for the industry will be better when coal companies select their salesmen with discrimination, train them up to the measure of the industry's needs and back them up with the industry's resources of merchandising skill, market research and technical know-how.

Needed Helps for Better Sales

TURNING TO SPECIFICS, what kind of organization, what kind of agency, will help the industry hold its present customers, win new ones and enlarge its markets?

The following are lines along which the industry can move with an odds-on chance for success:

1. Massing of tonnage and other resources behind big agencies set up for sales and service, either independent or supported by tonnage assessments upon participating producers.
2. Establishment of industry-wide or regional market-research agencies, plus machinery by which those agencies will have access to all the facts that can make their reports meaningful.
3. Systematic re-education of architects, consulting engineers, builders and heating-equipment suppliers in the merits of coal and modern coal-burning equipment, and enlistment of their cooperation in seeing that coal gets an even break or better among fuel customers.
4. Organization, preferably on a regional pattern for mobility and quick action, of teams made up of producers, engineers and salesmen to keep coal's story before school boards, city commissioners, plant managers and the like and to fight threats to displace coal with oil or gas in new or modernized equipment.
5. Establishment of permanent industry-wide or regional institutes to screen prospective salesmen and train sales executives, salesmen and sales engineers.
6. Establishment of scholarships in universities or technical institutes for combustion and design engineers.
7. Establishment of local short-period training clinics for boiler men and small-plant operators.
8. Concentration of efforts, with adequate capital subscribed by all who stand to gain by increased sales, to bring into commercial production, promote, advertise, sell and service all the products of research that make coal a more satisfactory fuel.
9. By broadening support and levying assessments commensurate with the industry's needs and opportunities, establishment of new goals for industry-wide research agencies and achievement of new speed in bringing research to completion and broadcasting new ways to use coal better.
10. A sustained search, collectively and individually, for opportunities to work closely with coal-consuming industries and, if wise and profitable, to integrate coal operations with those industries.

The opportunities for coal to make more sales—and better sales—are wide open. But to forestall further losses by default to oil and gas, the industry must move fast, with determination and imagination.

A good start already has been made. Through the efforts of several industry agencies and some individual companies, the forward movement is gaining speed. The big need today is still more speed and still more massed power. For that, it is late, but not too late.



AERIAL VIEW OF LOOKOUT STRIPPING (looking north) shows Lackawanna River at Carbondale, Pa., flowing in its new channel on clay-sealed backfill with another major stripping job in progress where the river used to be.

Recovering basin-bedded anthracite in a built-up area requires some unusual applications of equipment and techniques. Here's how the men and officials of John Booth, Inc., tackled the job of . . .

Moving a River to



1 **SPOIL** from stripping shovel is hauled to north end of original pit to build new channel up to grade.



2 **EFFECTIVE OVERBURDEN PREPARATION** has the double object of providing better loadability for the stripping unit and good compactability in the traffic-bound backfill.

Work a Strip Mine

UNUSUAL! That is the word for the stripping operations of John Booth, Inc., Carbondale, Pa., in view of the fact that one of the company's recent ventures required the relocation of the Lackawanna River to make possible the recovery of valuable deposits of anthracite. However, as far as the officials and employees are concerned, such jobs are accepted as routine, since the company is stripping in the Lackawanna River basin in a highly-developed area, as shown in the aerial photo.

In fact, a few years ago (January, 1950) *Coal Age* described the problems facing the company in moving a large dragline from one job to another, a move requiring the crossing of 11 railroad tracks, two highways, three high-tension transmission lines, a telegraph service line and a telephone toll cable.

To cap it all, Booth officials in their present basin operations must also contend with Fallbrook Creek, a sometimes-unruly tributary to the Lackawanna River. Both streams can be mean in wet seasons.

Operations are directed by Charles and Edwin Booth, president and treasurer, respectively, of the company founded by their father, the late John Booth.

LAY OF THE LAND

The Booth workings are concentrated at Carbondale, near the northeastern extremity of the northern anthracite field. The basin is relatively



EARLY OPERATIONS include opening up initial pit at north end of site for new river channel. A 5-yd dragline strips soft cover, a 5-yd shovel removes blasted overburden and a 2½-yd shovel loads New County-vein coal.



RECENT OPERATIONS include stripping, backfilling and loading in 24 ft of coal under the old river channel after the river has been moved. Compressed air powers drills and two 4-in electric pumps remove pit water.



3 **GOING DEEPER,** the loading shovel removes top bench of 24 ft of coal in the initial pit. New bed for the river will be 25 ft below railroad elevation.



4 **WHILE LOADING CONTINUES,** north end of pit is a beehive of activity with dike a-building to protect the railroad and the new river bed taking form.



5 **HERE'S A PORTION** of the new channel, backfilled, graded and compacted. The shovel is trimming the river side of the railroad dike and providing fill for depressions and pockets in the new bed.

narrow. Therefore, any attempt to recover the coal along the basin axis demands that the job be approached with one eye on the river and with prior plans for handling it.

A strata section from the surface downward to the bottom of the seams to be stripped includes: 10 ft of earth and gravel, 18 ft of rock, from 3 to 4 ft of coal in the New County vein, another 18 ft of rock, then 24 ft of coal in three thinly-separated veins known locally as the Top, Bottom and Third veins. The completed pit, therefore, may be up to 75 ft deep.

THE STRIPPING JOB

In outline, the river-moving job includes the following elements:

1. Obtaining authorization for the project from the Pennsylvania Department of Forests and Waters.



6 **NEW CHANNEL IS LENGTHENED** and brought to grade. Shovel and trucks provide material which bulldozers level as south-end stripping and loading continue.



7 **RIVER IS CONFINED** to a narrow earth flume in old channel to permit loading finishing material for new channel. This area is to be stripped next.

How to move a river: Make a logical plan—follow it, step by step . . .



8 **MORE EQUIPMENT** is moved to begin the second phase of the work (left) while the new channel (right), built up over the previously stripped area, is polished up and finally sealed to prevent inflow to underground mines.

2. Surveying the area to determine the best possible location for the new channel.

3. Planning alignment and gradient of the new channel so that its upstream and downstream junctions with the undisturbed portions of the river will be at original grade.

4. Stripping the area under the site of the new channel.

5. Backfilling completed sections of the pit with spoil from active sections to build up to the new-channel elevation.

6. Constructing the necessary dikes to confine water to the new channel.

7. Sealing the bed of the new channel with clay to prevent inflow to underground mines in the area.

8. Turning the river into the new channel by casting an earth dam across the original channel at the chosen turning point.

9. Opening a new pit where the river formerly flowed.

Among the major pieces of equipment used on the job are: a 2½-yd Bucyrus-Erie 54-B shovel for loading and occasional stripping; a 5-yd B-E Model 120-B shovel for stripping shot overburden; a 5-yd B-E Model 5-W dragline for stripping softer overburden; 15-yd Euclid end-dump trucks for hauling coal and rock; two International TD-18 bulldozers for leveling backfill and performing other pit duties; and a Schramm 600 air compressor to provide power for drilling.

Milestones in the progress of the work, which must be done right the first time, are shown in the accompanying photos. Use the aerial photo as a key. It shows the river in its new channel, with stripping operations underway where the river used to be.



9 **THE RIVER FLOWS** in the new channel, the earth-moving units are busy where the river flowed just a few days ago, and mine pumps discharge deep-mine water in the same volume and at the same elevation as before.



10 **WITH THE RIVER OUT OF THE WAY,** stripping units remove early overburden cuts to uncover anthracite under the old bed. Spoil area is at a premium; thus, backfilling will begin here as soon as possible.

And be prepared with auxiliary structures to help you hurdle difficulties



MOVING RIVERS means building bridges, like this one over the new bed location of Fallbrook Creek. Booth officials prefer stone piers, steel stringers and wood decking in spanning drainage lines which must be kept open.



1 **ALUMINUM CARS** are half the weight, stand up well and are self-cleaning.



2 **DIESEL LOCOMOTIVES** are considered safer and provide low-cost haulage. Eight 15-ton units now operate underground in Dosco collieries.

Modern Haulage for Dosco

THE GOALS: Peak face efficiency, sharply reduced haulage cost and safety.

THE MEANS: Aluminum mine cars, diesel mine locomotives and belt slopes to permit underground reconstruction and raise colliery efficiency and output.



VETERAN OF 5½ YR, the aluminum members of this original car are still good as new except for tear in right-hand corner.

THE CARDINAL PRINCIPLE that mechanized production at the face can reach its peak in efficiency only when it is backed up by the best in services is reflected in a major program of haulage improvements at mines of the Dominion Coal Co. Ltd., Sydney, N. S. A secondary benefit is a sharp reduction in haulage cost itself, in addition to greater safety.

The major directions in which Dosco is proceeding are three:

1. Installation of aluminum mine cars.
2. Installation of diesel mine locomotives.
3. Sinking of belt slopes to cut the cost of hoisting, permit modernization and simplification of underground haulage, and substantially raise total colliery output.

Particular emphasis is being placed on modernization and reconstruction at Dosco collieries on Cape Breton



3 **NEW BELT SLOPES** permit capacity increases and cheaper underground haulage, back up mechanized mining at the face. Here, at the start of No. 20 slope, belt-type overhead loader is in position to receive coal from mucking unit.

Island, where mechanization with the Dosco miner, a continuous machine engineered by the company and built in its own shops under license from the Joy Mfg. Co. (*Coal Age*, December, 1953) got under way May 2, 1950.

The coal seams in these Dosco collieries dip down under the sea from openings on the shore. The inclination is 5% to 20 deg, as a rule, and longwalling on faces 400 to 500 ft long was adopted as a result of thickening of the cover.

At approximately 1,200 ft, Cape Breton experience shows, the weight is too much for the pillars in room-and-pillar mining. Consequently, the coal is developed by slopes or deeps directly down the pitch. Walls are started near the slopes and are worked out along the strike. They are served by laterals, or approximately level openings, made in two stages: (1) initial driving; (2) brushing and permanent timbering for the life of the lateral after the face has advanced and the overburden has settled and stabilized.

Production comes from three seams in descending order: the Hub, the Harbour, and the Phalen. The Harbour and Phalen are recovered completely on an advancing front, making the system a modification of "horizon mining." Some of the operations have a production history dating back almost 100 yr, and since the main openings date back many years, their capacity is limited, especially shafts. In addition, main haulageways in the older workings were designed for cars of 1 ton or less and endless-rope or main-and-tail-rope haulage was employed in the early days and still is a factor in some collieries. The haulage modernization program, therefore, is aimed at breaking these bottlenecks and materially reducing cost, in addition to keeping face efficiency at a high level.

ALUMINUM FOR CARS

Four Cape Breton collieries of the Dominion Coal Co., Ltd., are presently included in the haulage modernization program. Aluminum cars have been installed in Nos. 12 and 18, and diesel locomotives in Nos. 1-B, 12, 18 and 20. Other collieries in addition to the preceding will be equipped with new cars and diesel locomotives as fast as places can be made and the units can be delivered. In addition, new belt slopes are being sunk at Princess colliery and at No. 20.

The first two aluminum cars to be used by Dosco, however, went into No. 20 colliery on Nov. 28, 1947. They were inspected and photographed by a *Coal Age* editor July 16, 1951, and then were returned to service. At that time, one car (see accompanying photograph) had a tear in one corner, and that was still the only damage when *Coal Age* again checked July 8, 1953. The aluminum members, in fact, still looked almost like new on that date, in spite of almost constant service for over 5½ yr entrain with the steel cars with which the aluminum cars were put for test. The water at No. 20 is mildly acid and, in contrast to the aluminum, steel bumpers, sidesills, gussets, stiffeners and other steel members installed for test purposes are badly corroded or have been replaced.

As a result of experience with the test cars at No. 20, a redesigned model with additional aluminum parts was standardized on, and the first batch of 75 was installed at No. 18 colliery in December, 1949 (*Coal Age*, February, 1952). The total at No. 18 now is 123, and, in addition, 610 have been installed at Dominion No. 12.

Capacity of the aluminum car is 3 tons. Weight is 1,920 lb, compared to 3,750 lb for the 3-ton steel car previously used at No. 18. Light weight is especially valuable in operation over slopes and planes necessary in practically all Dosco collieries because of pitches. In addition to light weight, and resistance to wear and corrosion, the aluminum cars also are self-clean-

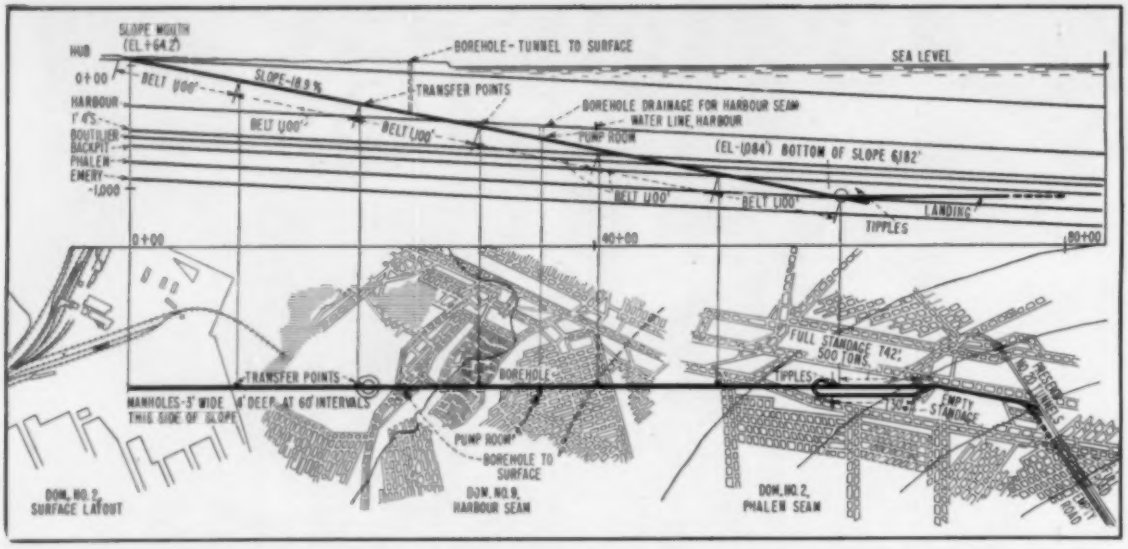


FIG. 1—TO EMPLOY FIVE 300-HP BELT CONVEYORS, each 1,100 ft long, the new No. 20 slope will permit more than doubling production capacity to some 10,000 tpd and make possible modernization of underground haulage.

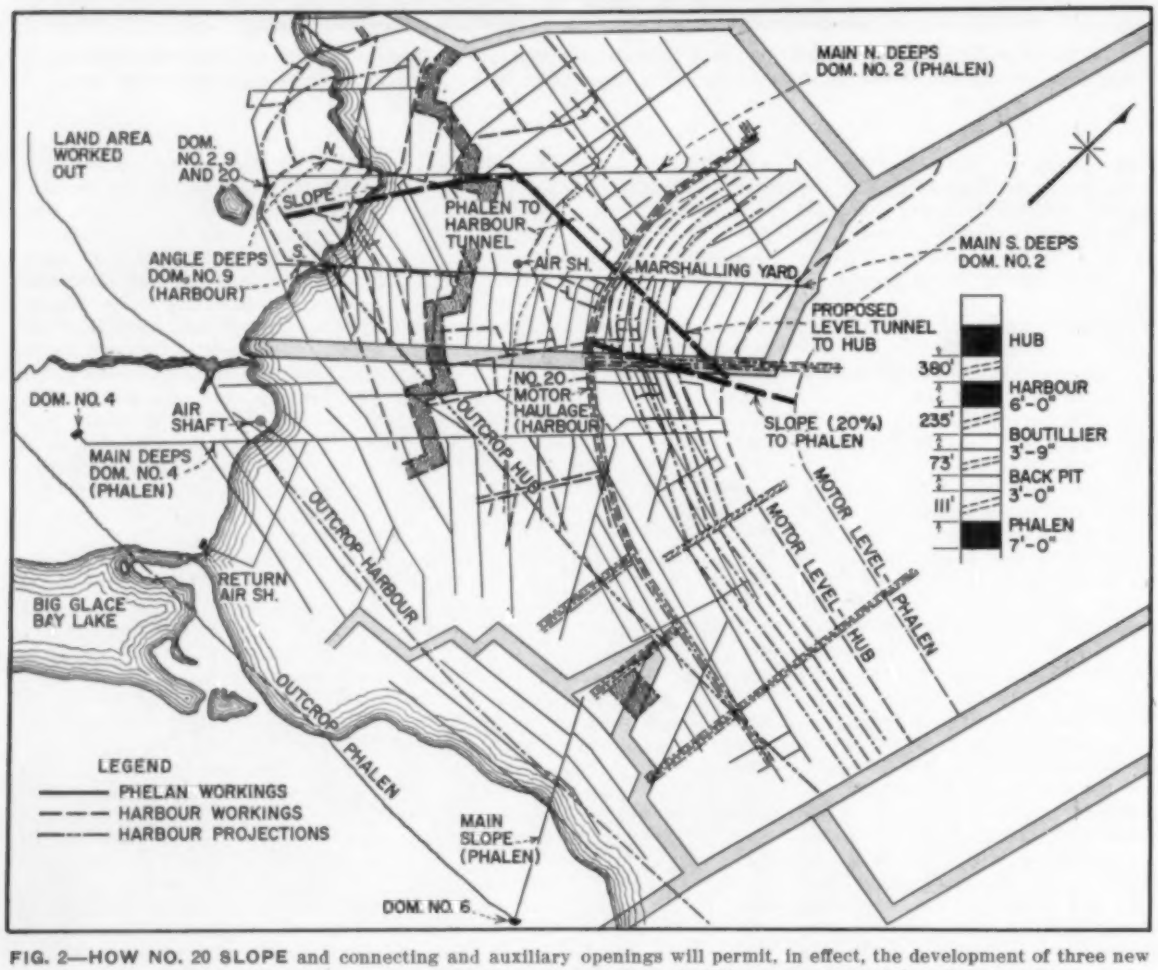


FIG. 2—HOW NO. 20 SLOPE and connecting and auxiliary openings will permit, in effect, the development of three new mines in three different coal seams, all with modern haulage facilities and substantial savings in cost.

ing and have high ability to absorb vibration. Consequently, splitting and tearing of the sheets after breaks occur are eliminated. However, the aluminum is easily scarred or gouged and must be protected against rubbing because of its softness.

The cars are supplied by the Eastern Car Co., Ltd., a Dosco subsidiary. Equipment includes Timken-bearing-equipped 16-in Dofasco cast-manganese wheels and Dosco CPR special fine-grain 0.45-carbon axles.

DIESEL HAULAGE

The eight diesel locomotives now in service underground at Dosco collieries also reflect a long search for a haulage medium that would replace rope systems on level roads and at the same time eliminate open wiring underground. Such wiring would be especially hazardous and troublesome because haulage roads are through the gob and consequently are subject to subsidence and distortion until the main roof settles and the roads can be brushed and rebuilt to permanent condition.

Methane ignition was another hazard of electrical operation considered by Dosco in turning to the diesel, which is considered safer than open wiring, and Dosco men also felt that there could be a saving in cost of installing and maintaining such wiring. Finally, it was felt that the locomotives themselves would be simpler and safer to operate, and easier to maintain, in addition to providing a lower over-all haulage cost.

Goals in the search for a satisfactory locomotive for Dosco operations were a machine weighing not less than 15 tons, rated at not less than 100 hp, and not over 5 ft high. It was found in the North British "Miner," powered by a 100-bhp Crossley BWL 5, 5-cylinder in-line diesel engine with 3-speed transmission for rated speeds of 3, 6½ and 15 mph. Weight is 15 tons. Tractive effort, 25% adhesion, is 8,400 lb. Length over bumpers is 15 ft 1 in; width, 4 ft; maximum height, 4 ft 5 in.

The locomotives are used in both mainline and lateral service—in either case on approximately level roads. On the laterals, they operate up to within 300 ft of the advancing longwall faces.

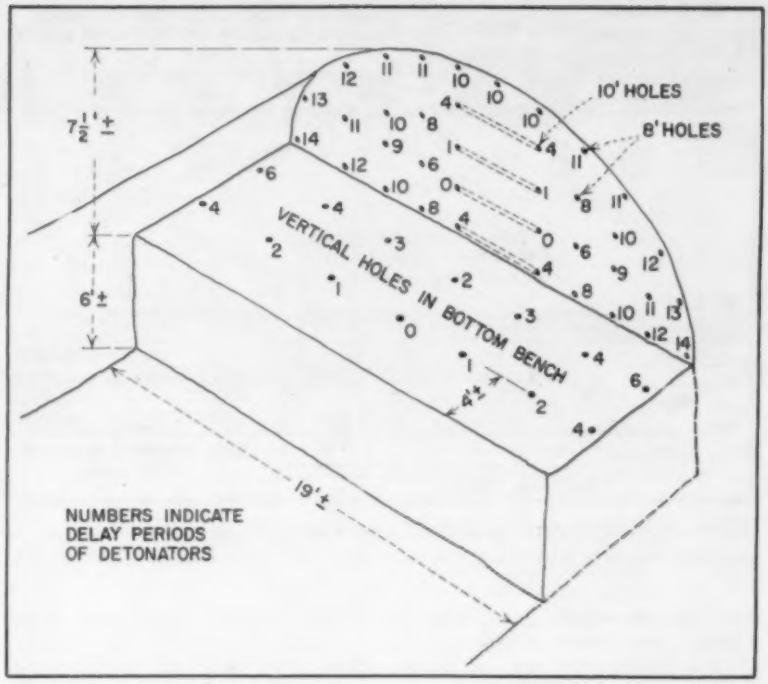


FIG. 3—BENCH OPERATION in sinking No. 20 slope, showing drilling pattern.

Equipment, operation and inspection of the diesels is governed by regulations promulgated by the Province of Nova Scotia. As noted previously, the elimination of the open wiring necessary with electric locomotives is considered a major advantage under Dosco conditions, especially in laterals subject to subsidence and reconstruction for permanent service. As compared to ropes particularly, the use of diesel locomotives also has sharply reduced injuries to haulage men.

From the cost standpoint, studies at

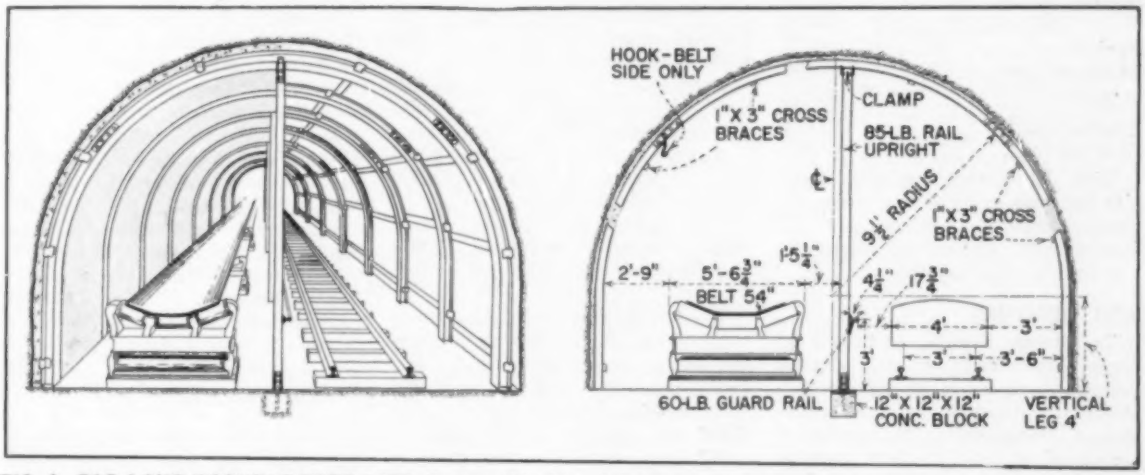


FIG. 4—FOR LONG TROUBLE-FREE LIFE, the new No. 20 and Princess slopes are lined with steel arches and 18 in of concrete placed, at No. 20, with pumping equipment that can deliver mixed concrete 3,000 ft in from the surface.

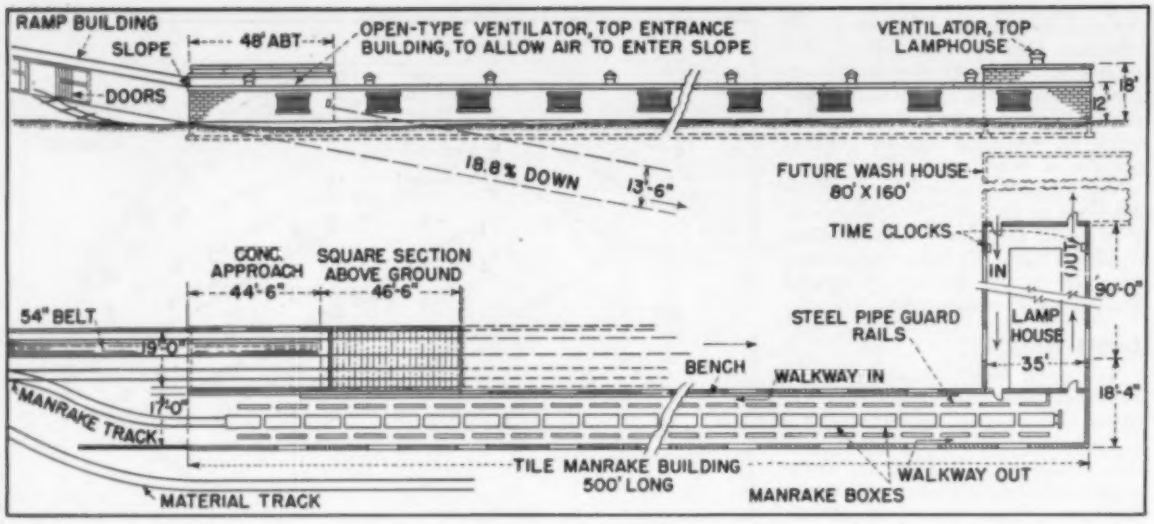


FIG. 5—CONVENIENCE, COMFORT AND FAST LOADING AND UNLOADING are the goals in the design of the man-trip facilities to be installed at the top of the new No. 20 slope. The portal, for 1,000 men, will cut travel time in half.

two collieries where the diesels replaced ropes shows a reduction of 30% in haulage cost per ton at one, and the same at the second.

Routine inspection and maintenance of the diesels is carried out in special underground garages fitted with pits and hoists. On laterals, these garages usually are constructed at the outby ends, one for each lateral so far. Consideration is being given to providing slants between pairs of laterals to permit two locomotives to use the same garage, which naturally is in fresh air.

Cost of repairing and maintaining one diesel over a period July 1-Feb. 8, was 4.7c per ton, based on a wage scale of approximately $10 per shift. The breakdown is as follows:

Servicing locomotive	$2,848.64
Repairs: Labor	195.08
Materials	481.65
Fuel oil	349.11
Lubricating oil	194.99
Total	$4,069.47
Tonnage hauled	87,097
Cost per ton	$0.047

With locomotive haulage, Dosco also has gone to the use of automatic doors—usually installed in pairs to form airlocks. The savings return the cost in only a few months.

BELT HOISTING

To increase capacity at two of its Cape Breton collieries, and also to permit — particularly at one — reconstruction and modernization of underground transportation to achieve a saving of up to 75%, and perhaps more, Dosco is now sinking two belt slopes.

The Princess slope will permit doubling present capacity, now limited by the size of the shaft, to 4,000 tons per day of two shifts. Salient details are:

PRINCESS SLOPE

Length main slope, ft	3,355
Length cutoff for man-trip road	470
Total length slope and tunnel	3,825
Slope inclination, deg-min-sec	11-26-50
Total lift, ft	680
Size slope, semicircular, dia ft	18
Length of leg under semicircle, ft	4
Height at center arch, ft	13
Lining, concrete, 56-lb steel arches; center distance of arches, ft	2½
Finished area slope, sq ft	199
Rock removed from slope, cu yd	35,000
Steel to be used, tons	500
Concrete in slope lining, cu yd	8,200
Bags of cement	52,500
Number belts in slope	3
Number belts on surface	2
Horsepower per belt unit	300
Weight of belt required, tons	32

The No. 20 slope and auxiliary tunnels underground are expected to permit raising output, now limited by shaft capacities and underground transportation facilities, from around 4,000 tons per day to approximately 6,000 tons when the first stage is completed and to 10,000 tons when everything is done, in addition to reducing haulage costs, cutting travel time and supporting mechanized face operations by more-efficient haulage. Salient details are:

NO. 20 SLOPE

Length of slope, ft	6,225
Length horizontal tunnels, ft	3,846
Total, ft	10,071
Depth cover at end of tunnels, ft	940
Depth ocean over end of tunnels, ft	70
Distance between ocean bottom and tunnel at shore line, ft	405
Slope inclination, deg-min	10-42
Total lift, ft	1,148
Size slope, semicircular, dia ft	19
Length of leg under semicircle, ft	4
Height to center arch, ft	13½
Lining, concrete, 56-lb steel arches; center distance of arches, ft	2½
Finished area slope, sq ft	218
Rock removed from slope, cu yd	62,000
From horizontal tunnel	38,000
Steel to be used, tons	1,500
Concrete in lining, cu yd	20,872
Bags of cement	131,589
Number belts in slope	6
Number belts on surface	2
Horsepower per belt unit	300
Weight of belt required, tons	84

Figs. 1 and 2 show the position of the new No. 20 slope and connecting underground roads to present and proposed workings in the three seams

being and to be recovered—the Harbour, the Phalen and the Hub. When reconstruction is completed, it is expected that the Hub, or top, seam will provide 1,000 tons per day; the Harbour, 6,000 tons; and the Phalen, or bottom seam, 3,000 tons.

All coal from all three seams will come to a marshalling yard in the Harbour seam at the end of a tunnel already in existence, which will be connected via a new stretch of tunnel to the slope. At the foot of the slope, the coal will be dumped onto the series of 54-in wide belts for hoisting to the surface.

From the marshalling yard, the Hub will be tapped by a level cross-measure tunnel starting at the marshalling yard. The Phalen below will be tapped by a slope on a 20% grade down from a point on the main Harbour haulage road approximately 2,500 ft east of the marshalling yard. This slope will be equipped with an 1,800-hp electric hoist.

Thus, all the coal from the workings in the three seams will, as noted, come to one point for movement by 15-ton trolley locomotives to the belts. Among other things, this will permit the installation of 3-ton aluminum cars and heavy track, with a major saving in haulage cost. For example, reconstruction will do away with haulage facilities introduced in 1866 and involving 4 mi of endless rope, 1-ton cars and a 23½-in-gage track. The alternative would have been deepening the existing shaft and driving a level tunnel. With the slope, however, this area becomes practically a new mine at the cost of driving a short tunnel, and the slope is available as the basis for low-cost flexible development for all coal within its reach for up to 100 yr. In fact, the new slope in effect permits opening new mines with modern facilities and equipment in all the seams to be mined, with consequent substantial savings in cost.

Pending the completion of No. 20 slope, however, Dosco has taken certain other steps for immediate relief from certain high costs. One was the replacement of the old steam hoist and boiler plant dating back to 1866 at No. 4 shaft with an electric hoist, which will save its cost in a year. When the new slope goes into operation, this unit will become a standby and emergency hoist.

SLOPE SINKING

Except for length and size, both the Princess and No. 20 slopes are similar in construction and are being sunk with similar methods and equipment. Air-leg drills are employed at the face, and tungsten-carbide bits are used instead of the throwaways originally employed. Bit cost increased 5 mills per cu yd, but has been more than offset by gains from increased drilling speed.

The face is drilled, shot and mucked in benches. In other words, the top half is 8 to 12 ft ahead of the bottom half for at least part of the cycle. Fig. 3 shows the drilling pattern employed in No. 20 slope. The inside holes in the upper bench are Veed to the center to open the cut up and reduce the burden on the side holes, drilled 8 ft deep. A somewhat similar system, also using millisecond delays, is used in opening up the bottom half of the bench.

Muck is removed by Ingersoll Rand 3-drum slushers, which discharge to an overhead trip loader of the belt type (see accompanying illustration). This loader discharges to mine cars holding 2½ to 3 tons on the track beneath for hoisting to the surface. At No. 20 slope, the permanent hoist was installed for sinking and presently is equipped with a 700-hp motor, which will be replaced with a 1,300-hp unit for handling men and materials when the slope is completed.

Water has been a problem and has made sinking unexpectedly difficult. As a result the best advance at No. 20 slope to the time the material was gathered for this article was 55 ft in one week. Since that time it has risen to 75 ft per week and is expected to rise still more as the slopes are dried up. Princess was started in a bog area, and a small coal seam over the initial length of the slope was in large part responsible for an initial inflow of approximately 300 gpm at No. 20. As an experiment, a well 150 ft deep was drilled ahead of the Princess slope and was equipped with a 100-gpm 7½-hp floatless liquid-level-controlled deep-well pump. There was sufficient flow into the well for this pump to operate at capacity, and it proved quite effective in reducing water in the slope. A similar pump was to be installed in a 200-ft well at No. 20 slope.

Lining details and equipment placement in the No. 20 slope are shown in Fig. 4. Concrete supplemented by steel arches was considered essential because of the expected long life of both the Princess and No. 20 slopes. The steel 3-section arches, with steel center supports, are supplemented by steel stringers at the back. Then concrete is poured flush with the faces of the arches. The lining is installed in 300-ft sections. Protection before installation of the lining is provided by bolting both the roof and sides. Each time a cut is loaded out by the slusher, the first operation of the drillers is placing the bolts. They have proved quite successful in holding the strata.

The concrete lining is poured in sections 30 ft long, using Blaw-Knox prefabricated portable forms. An innovation is the use of ready-mixed concrete delivered to the point of placement by pumping with a Pumpcrete machine. In other words, the mixing trucks deliver to the hopper of the Pumpcrete unit, which pumps the concrete down the slope to the forms.

It is expected that the initial Pumpcrete unit can deliver a distance of 1,500 ft, at which time a second unit will be installed to relay the concrete another 1,500 ft. After that, it is planned to obtain the concrete in the form of a dry mix and deliver it to the 3,000-ft point for mixing and pumping, and thus continue the lining to the bottom of the slope. Lining thickness is 18 in at No. 20.

This system of obtaining, and placing concrete has so far resulted in a cost of about half that of mixing on the job in the usual manner. As high as 92 cu yd has been placed in 6¾ hr, representing 30 ft of slope lining. Cost has been as low as $25 per cu yd placed, and normally is less than $30 on the basis of an average wage of approximately $10 per shift.

For ventilation during sinking, the slope is being partitioned down the center with 5/16-in plywood nailed to 2x4s. At $2.52 per sheet, the cost is $25.78 per yard of slope, including labor of installation and 17½% overhead, and is materially cheaper than plank.

HANDLING MEN

Since the No. 20 slope eventually will be the portal for perhaps 1,000 men, major consideration has been given to handling and transporting men. The men will be delivered to within 300 to 500 ft of their working places by special rakes, or trips. These will leave from and return to a man-trip-loading building on a sidetrack at the top of the slope, as shown in Fig. 5. From the washhouse the men will walk in past the "In" time clock, secure their lamps and walk out into the man-trip-loading building, equipped with benches along the wall and guard rails on track side.

If a shift is changing, the men will leave the trip on the "Out" side and the new crew will board from the "In" side. The crew leaving the mine then will walk out through the opposite side of the lamphouse past the "Out" clock and into the washhouse.

The slope is expected to cut travel time from an average of 1 hr 20 min to around 40 min per shift.



1 **DRILLING** for installation of a 1½x36-in wood roof pin.



2 **PIN INSERTION,** with an 8-in-long wedge in place at the top of pin.



3 **PREPARING TO DRIVE** wood pin and expand the upper wedge.



4 **PREPARING TO DRIVE** bottom wedge to complete the installation.



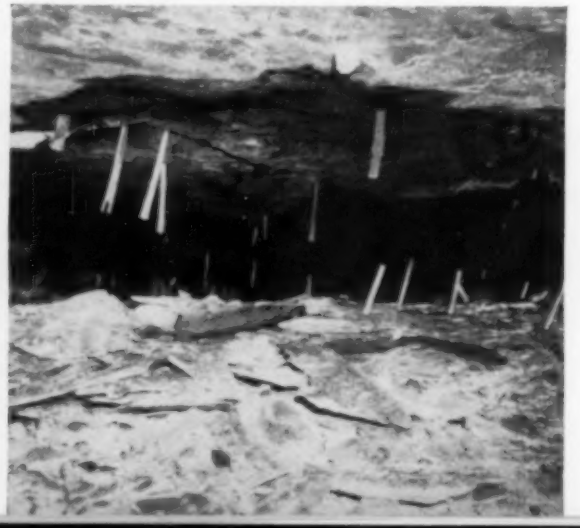
5 **INSTALLED IN PRODUCTION CYCLE**—Wood pins on 4-ft centers in a 20-ft room. Some 50,000 wood pins have been installed at Mary Gail No. 3 mine.

How Wood Pins Are Used . . What the Results Are

SUCCESS . . . AND FAILURE

WOOD PINS still holding shale top 10 mo after installation in room (below, left). Photo at right shows extreme case of failure. Top fell 1 mo after installation. Few pins broke in tension. Practically all pulled loose at the top or bottom in the hole.





How Wood Pins Serve Mary Gail

$30,000 saving has marked use of wood roof pins in rooms at new No. 3 truck mine of the Mary Gail Coal Co., but limitations cut use elsewhere. With payroll never exceeding 100 men, daily outputs up to 2,500 tons in room work are achieved with loaders, shuttle cars and belt haulage.

By J. H. EDWARDS
Associate Editor, COAL AGE

WOOD PINS have reduced roof support cost by approximately $30,000 at the 2,500-ton Mary Gail No. 3 mine of the Mary Gail Coal Co., near Hyden, Leslie County, Ky. Experience with wood pinning at this mine since January, 1952, has demonstrated that locally the method has a definite place in room work but shows no promise as a substitute for steel roof bolts in places that must stand for several years. This relatively new mine, operated with off-track face equipment and main belts and held to a total payroll of 100 men, produces 1,800 to 2,500 tons per 2-shift day, depending on whether production is confined to development or is from rooms.

The mine is managed by M. H. Smith, partner in Mary Gail and in the Smith Coal Co., of Wooten, Ky., where Mr. Smith's offices are located. Coal from Mary Gail No. 3 mine is trucked 31 mi west to Manchester, Ky., where the company operates a Roberts & Schaefer preparation plant loading to the L. & N. Ry. A 135-tph Hydrotator washes 1x¼-in and a 75-tph Airflow table air-cleans the ¼x0. Domestic and steam markets are served and emphasis is placed on high quality, particularly "Kentucky Maid" washed stoker.

Mary Gail No. 3 Mine is a drift operation opened in July, 1950, in the Hazard No. 4 seam, which lies practically level, is 54 to 60 in thick and has no continuous partings. Immediate top is a soft shale which extends up 15 ft to a rider seam which in turn is capped by a strong sandstone. Bottom is a fire clay which softens badly when water is present. This condition necessitates planking the shuttle-car roadways in many places.

MINING TRACKLESS

Principal items of mining equipment regularly in use are:

2 Joy 11-RU rubber-mounted cutters.

1 Joy 11-B shortwall with T2 truck.

3. Joy 14-BU loaders.

6 Joy 8-SC 3-ton shuttle cars with 400-ft cables.

2 Joy 32-E 3-ton shuttle cars with 400-ft cables.

5 Chicago-Pneumatic hand-held electric coal drills, using Carboloy and Firthite bits for drilling holes for Airdox breaking.

1 Chicago-Pneumatic RD 30 rotary electric drill using Carboloy and Firthite bits to drill holes for steel roof bolts in entry work.

1 Joy 105-cfm rubber-mounted air compressor.

1 Acme 210-cfm rubber-mounted air compressor.

3 Cleveland stopers using "Liddicoat" throwaway bits.

Shuttle cars dump directly to belts. Of the six belt drives in use, three are Hewitt-Robins and three are Joy. Rooms 300 ft deep are advanced 20 ft wide on 50-ft centers. Entry headings, five per entry for both mains and cross entries, are 12 ft wide on 50- and 35-ft. centers. Pillars are robbed on retreat from the sections.

WOOD PINNING

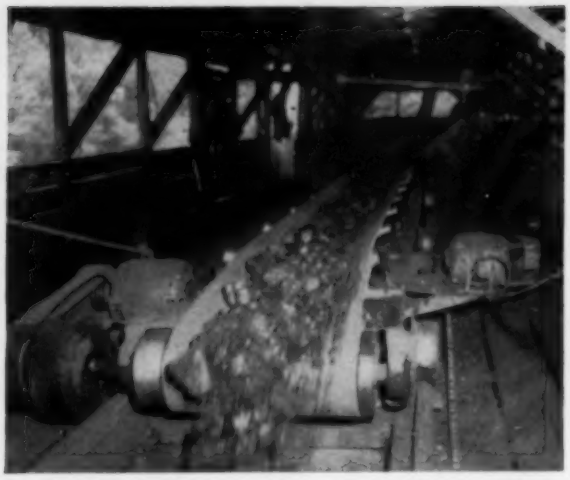
Wood pinning was started in January, 1952, in both rooms and entries but after 8-mo experience, during which falls developed in wood-pinned places in especially bad top, it was decided that wood was not suitable for entries that would have to stand





STEEL BOLTING—Drilling for shuck-type steel bolts in development work (left). Right photo shows mounted cutter tramming under steel-bolted roof, with Clay Sampsell (left), section foreman, Woodrow Woods and Manuel Howard.





MAIN HAULAGE at Mary Gail is by belt, here delivering to a shuttle belt (left). Shuttle belt (right), mounted on wheels and controlled by push button, puts coal in any desired spot in 10-gate 1,000-ton truck-loading bin.



TRACKLESS MINING EQUIPMENT at the 2,500-ton Mary Gail No. 3 mine includes shuttle cars dumping to end of section belt.

2 yr or more. Wood pinning was continued as the standard method for rooms. For the past several months room mining has been discontinued in favor of pushing development. Therefore no wood pins have been used for some time. With resumption of room mining wood pins again will be installed.

Pins are made of hickory and other hard woods and cost 24c each at a mill in western Kentucky. They are 1½ in in diameter and 36 in long, with 8- to 10-in sawed slots at each end. Approximately 50,000 wood pins had been installed up to the time of discontinuance of room mining. The $30,000 saving was based on 36-in shuck-type steel roof bolts costing 87c each. Labor costs of installation of wood and steel are the same. Since roof in No. 3 mine permits rotary electric drilling, and no air hammer is required to install shuck-type steel bolts but is necessary for driving pins, the investment in equipment for wood pinning is considerably greater.

Generally speaking the wood pins do not begin to fail until about a year after installation. Where the immediate shale top is hard the wood pins do very well, but in softer top, generally under low cover and where the air cuts the roof around the pin, plates are necessary and that dictates the use of steel bolts. In the worst top encountered in the mine, even steel pins with washers will not hold an entry very long. The last resort is conventional wood timbering.

The wood pins are placed on 4-ft centers each way and the steel bolts on the same pattern. In either case the yield per bolt is 6 tons.

THREE UNITS OPERATED

Three units working two shifts (6 unit-shifts total) regularly produce 1,800 tons per day or 300 tons per unit-shift. When the three units are in rooms, the tonnage hits peaks of 2,500 with the same 100-man force, including mine supervision but not including truck drivers or the men operating the preparation plant at Manchester.

The mine is operated non-union and works 5 days per week. The first shift is from 6 am to 2 pm and the second from 3 pm to 11 pm. Six men constitute a supply crew and work 11 pm to 7 am taking materials in on belts, etc.

Mary Gail No. 3 mine is open to tourists who will come equipped with coveralls and report at the mine in time to ride in on the belts at 3 pm or 6 am. A guide will be furnished on short notice to show the underground machinery in operation. Clyde Franks is general superintendent and Rex Howard is general mine foreman.

The storage bin, with 10 gates for loading trucks, holds 1,000 tons. Distribution of the coal from the discharge of the mine belt to the length of the bin is accomplished by a 30-in belt conveyor 80 ft long mounted on track wheels. Through push-button control, it can be shuttled to drop coal into the bin at any point.

Trucking to Manchester is handled principally by contractors. Fifteen tons is the usual load but some of the trucks carry 18 tons.

Successful Electric Braking Of AC Mine-Hoist Drives

What the various systems of electric braking offer for mine-hoist application.

How they compare from the standpoints of performance, operating efficiency, energy demand and safety.

By A. H. HUELSMAN, Industrial Engineering Section
General Electric Co., Schenectady, N. Y.

ONE OF THE MAJOR FACTORS affecting the success of an AC mine-hoist drive is its ability to electrically brake the hoisting system with precision, ease and safety. The degree to which successful operation can be obtained depends largely on the selection and application of the correct or appropriate method of electric braking for each installation. The hoisting duty and cycle must be carefully studied so that the correct method of electric braking can be employed.

The mine-hoist drives under consideration are those employing AC wound-rotor induction motors and arranged for operation through master-switch control of primary reversing and secondary resistor contactors. Auxiliary or supplementary electric-braking equipment should usually be used for this type of drive whenever the load overhauls the motor prior to deceleration or if reduced speed operation is effected with overhauling loads.

Various typical hoisting cycles are shown in Fig. 1. Cycles C and D are representative of overhauling load operation for which auxiliary electric braking should be used. Cycle A requires a positive motoring torque throughout the cycle and thus does not require electric braking. Cycle B is a borderline case, requiring only slight electric braking during deceleration. Since the load is not overhauling, and only a low-torque braking effort is required, this type of cycle usually will not require additional auxiliary electric-braking equipment.

Judgment in the selection of mine-hoist drive control must be exercised, however, whenever men or material are to be lowered into a mine on the production hoist. In such a case, the production hoisting cycle may approximate Cycle A in operation, while the cycles for lowering of men or material are similar to Cycle C. Under this condition, it is suggested that auxiliary electric-braking equipment be used so that the overhauling cycles can be successfully performed with dispatch and safety.

As shown in Fig. 2, the motor is capable of regenerating only when driven above its synchronous speed, and not at speeds less than synchronous. Introduction of resistance into the rotor circuit will cause the motor to decelerate or slow down when handling a positive, or motoring, load, and to accelerate with an overhauling load. Therefore, the operator must exercise unusual care in moving the master controller to secure the desired operating speeds. This is especially true and necessary when operating with varied cage or skip loadings and when handling motoring and overhauling loads.

Various methods of electric braking have been devised because of this limitation. The following types will be discussed:

1. Regenerative braking.
2. Reverse power braking.
   A. "Counter-torque" or "plugging."
   B. Modified "plugging" using two motors in opposition.
3. DC dynamic braking.

REGENERATIVE BRAKING

Regenerative braking is readily utilized during the "full-speed" portion of the operating cycle when handling overhauling loads such as required in Cycles C and D. During regeneration, and with the master controller in full-speed position, the machine will operate above synchronous speed by the value of slip corresponding to the load being handled. Power

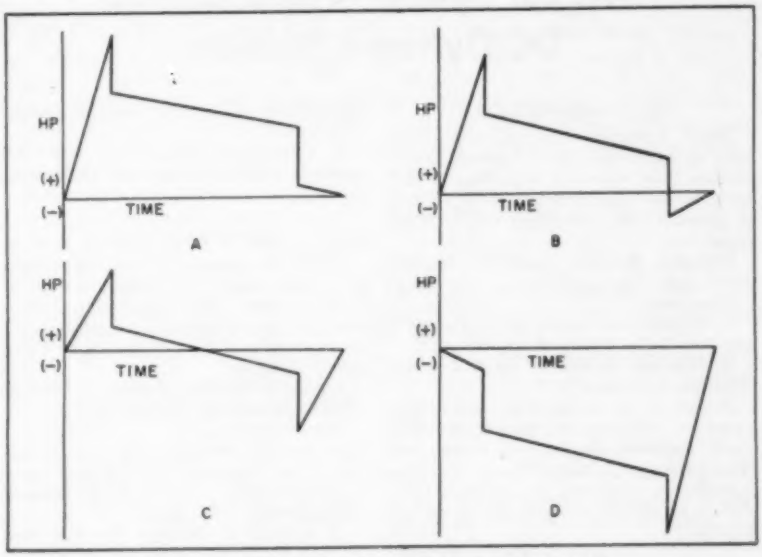


FIG. 1—TYPICAL DUTY CYCLES for mine hoists.

Adapted from a paper presented at the 1953 AIEE Middle Eastern District meeting, Charleston, W. Va.

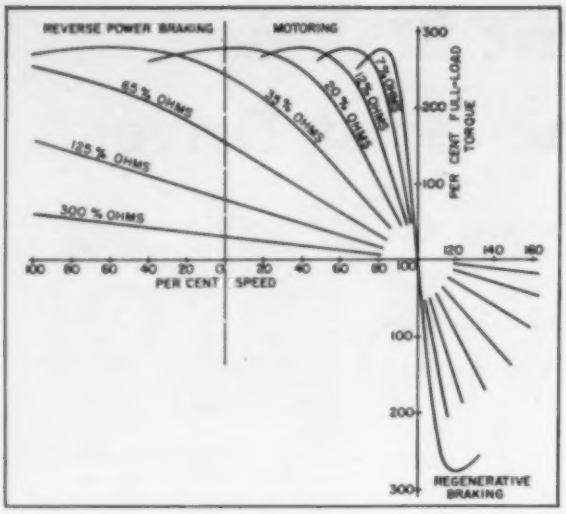


FIG. 2—TYPICAL SPEED-TORQUE CURVES for an AC wound-rotor motor.

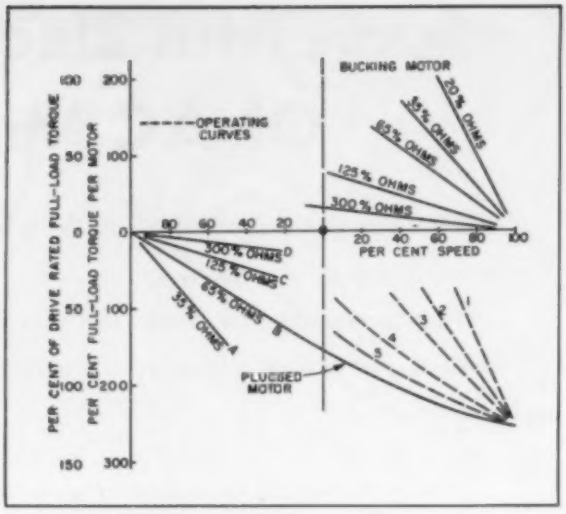
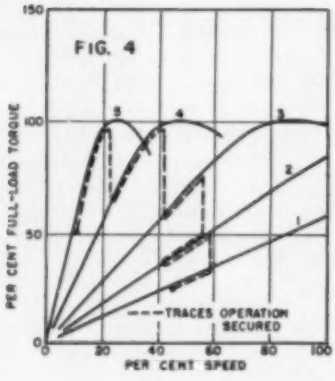
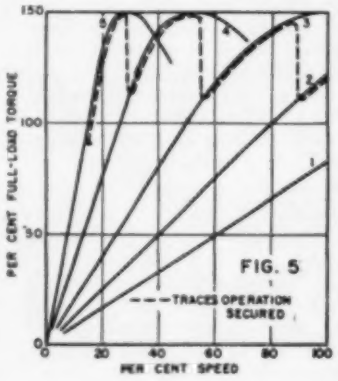


FIG. 3—SPEED-TORQUE CURVES for reverse power braking using two motors in opposition.





Typical Speed-Torque Curves DC Dynamic Braking

FIG. 4—EXAMPLE I

Duty: Lowering load of men (light load) at approximately 50% speed. Overhauling load torque at beginning of descent is 25%, increasing to 50% at end of travel. Change in torque due to hoist rope.

Dynamic Braking Excitation Setting: 100% (light load condition).

Operation:

1. Release mechanical brake and permit load to accelerate the system.
2. Dynamic brake on Point 1 when 42% speed is neared.
3. Speed will increase as load torque increases. When speed approaches 60%, move controller to Point 2. Speed will drop to approximately 40%.
4. Speed increases to approximately 55% as torque increases to 50% at end of travel.
5. Decelerate drive by placing the controller on Point 5 of braking. Time relays control deceleration to approximately 10% speed.
6. System is brought to rest and spotted with assistance of mechanical brake.

FIG. 5—EXAMPLE II

Duty: Decelerating empty trip of cars (90% load torque) at bottom or end of travel during normal production operation. An average braking torque of 130% is required to decelerate system to a low speed in 10 sec.

Dynamic Braking Excitation Setting: 150% (normal load condition).

Operation:

1. As end of travel is approached, move controller to Point 5 of braking.
2. Time relays control deceleration to approximately 13% speed.
3. System is brought to rest and spotted with assistance of mechanical brake.

from the load is regenerated into the power system through the motor. Occasionally installations require increasing the hoist-system speed further above synchronism when handling overhauling loads. This is accomplished by moving the master controller from the full-speed position, thus inserting external resistance into the rotor circuit. The increase in speed above synchronism is governed by the amount of resistance inserted into the rotor circuit and by the value of the overhauling load torque. The hoist-motor rotor must be banded to withstand the higher speed at which it must operate.

It is impossible to secure regenerative braking for speeds under synchronism. Other methods for braking overhauling loads must be used to bring the hoisting system to a low-speed or rest position.

REVERSE POWER BRAKING

"Counter-torque" or "plugging" control is obtained by reversing the primary connections while the motor is rotating. Reverse torque from the motor is applied to the load in a direction to decelerate the system. A typical family of speed-torque curves for "plugging" operation is shown in Fig. 2. These curves also serve to show that speed regulation is very poor, since a small load change will cause a large change in speed. Control of the drive is difficult, especially when the drive is at low speed. The operator must be quite skilled in maneuvering the controls for "spotting" the skip or cage at the landing. The mechanical brakes are usually required to assist in stabilizing the system speed and also to

Evaluation of Electric Braking for Overhauling Loads

	REGENERATIVE BRAKING	REVERSE POWER: COUNTER-TORQUE OR PLUGGING	REVERSE POWER: TWO MOTORS IN OPPOSITION	DC DYNAMIC BRAKING
ABILITY TO REGULATE SPEED	Suitable full speed only; in rare cases, used above full speed.	Difficult — small load change causes large speed change.	Equivalent to or better than performance on motoring characteristics.	Better than performance on motoring characteristics.
ABILITY TO DECELERATE DRIVE	Not capable of braking below synchronous speed.	Exceedingly difficult to stop without considerable use of mechanical brake; danger of drive reversal.	Low speed obtainable within 75% rated drive torque—operator must select correct controller position.	Always provides well-regulated and stable low speed on same controller position.
POWER CONSUMPTION	Delivers load energy back into power system.	Line energy required is two times load energy; wasteful.	Total line energy required is two times load energy plus two times line energy for bucking motor; very wasteful.	Negligible — required excitation only for hoist motor acting as generator.
MAINTENANCE	Normal.	Electric and mechanical equipment subjected to severe duty.	Electric and mechanical equipment subjected to severe duty.	Low—only torque required to brake the load imposed on equipment.
SAFETY	Safe operation.	Questionable; degree of safety strictly dependent on skill of operator.	Safe within 75% rated drive torque.	Provides safe and positive speed control from full-speed to standstill.

reduce the possibility of over and reverse travel. This method of electric braking is wasteful of power and also places severe duty on the secondary resistor since it must absorb all the energy from the line and from the load. The electric and mechanical equipment are subjected to severe duty, resulting in high maintenance.

This method of electric braking is used in many cases, but usually with the penalty that the operator decelerates the drive short of the landing and then motors into the mechanical brake to spot the skip or cage. Over-all hoisting efficiency and production are seriously impaired. Low-speed high-torque operation for spotting also imposes additional heavy duty on the hoist motor.

MODIFIED PLUGGING

This variation in "plugging" control requires a dual motor drive. One motor is "bucked against" the second for operation at sub-synchronous speeds with overhauling loads. The families of speed-torque curves for this method of braking are shown in Fig. 3. The operating speed-torque curves are secured by subtracting the positive torque of the bucking motor from the braking torque (Curve B) of the "plugged" machine. Plugging Curves A, C or D may also be selected, if desired, to meet conditions of a specific braking duty. The family of operating curves offer good speed control from full speed to rest.

The ordinate of Fig. 3 shows that the braking torque available with this method is only half that of a conventional drive. Only half the connected electric drive is available to supply braking torque to the hoisting system. The plugged motor alone must perform the entire braking duty. In addition, it must overcome the torque of the bucking motor which is connected to drive or to keep the hoisting system in motion. Since the braking torque available with this method is limited, it is generally necessary to supply over-size motors for mine-hoist applications with overhauling loads.

This system of braking is not capable of repetitively reducing the hoist speed to a low stable value on a given controller point when the hoist is handling varied loads. Furthermore, the operator must adjust the controller to overcome the torque of the overhauling load during deceleration and then must readjust the controller position to reduce the motor-braking torque to the value that will permit the system to operate at a reduced speed.

It is readily apparent that to obtain speed control or deceleration by bucking one motor against the other, power consumption must exceed that required for the conventional plugging method previously discussed. The plugged motor must oppose the positive torque of the bucking motor in addition to supplying braking torque for retarding the hoist.

The duty required of the electric and mechanical equipment is severe, with attendant high maintenance. The operating disadvantages of this method of braking have resulted in only limited application on AC mine-hoist drives.

DC DYNAMIC BRAKING

Another method for braking control is the DC dynamic braking system in which the AC wound-rotor motor is operated as a generator when driven by the load.

This is accomplished by disconnecting the motor from the AC power source and exciting the stator windings from the DC source. Then, when the rotor is driven by an overhauling load, the motor becomes an AC generator and a voltage is generated in the rotor. The machine develops a braking torque at the motor shaft, energy from the driving load being

dissipated in the rotor and external rotor resistor. The magnitude of the braking effort is dependent on the amount of DC stator excitation, the resistance of the motor secondary circuits and the speed of the motor.

Families of typical speed-torque curves are shown in Figs. 4 and 5. Also shown are typical operations, as traced, for various loads and speeds, which indicate the ability of the system to control speed and to decelerate the drive.

The system is devised to provide a speed control with overhauling loads that is better than that secured when handling a positive-torque load at sub-synchronous speeds.

DC dynamic braking greatly reduces the use of the mechanical brake. It is capable of repetitively reducing the hoist speed to a low stable speed without the danger of drive reversal, and to a speed from which the operator may accurately spot the skip or cage. Only a small amount of power is required for the small braking m-g set which excites the hoist motor, and thus the electric efficiency of the hoist drive is measurably increased.

Dynamic-braking control for mine-hoist drives has successfully proven itself in many installations in this country and abroad. It is the tool that eliminates a severe handicap of the AC mine-hoist drive. DC dynamic braking permits the operator to control overhauling loads at sub-synchronous speeds with ease and confidence, thus increasing the over-all operating efficiency and safety of the hoisting operation.

The chart on the previous page tabulates and evaluates the various methods of electric braking, with comments on ability to regulate speed and decelerate the hoisting system, power consumption, maintenance and safety. As stated previously, one of the major factors affecting the success of an AC mine hoist drive is the ability to electrically brake the hoisting system with precision, ease and safety. As shown in the accompanying chart, the only method of electric braking to qualify and meet these conditions is the DC dynamic braking system.

A typical application of three systems of electric braking for deceleration of a hoist drive with a retarding duty is shown in detail in the accompanying section (Figs. 6A through 8B). While the calculations are for only one set of duty conditions, they illustrate the comparable energy requirements of the systems which would be encountered in similar installations. Note the high energy input from the line and the severe duty on the resistor in Examples I and II.

Typical Application of

A comparison of the energy requirements of various braking systems is shown in the following sample calculations based on a typical deceleration of a hoist drive having a retarding duty as follows:

Hoist drive ..... **Two 300-hp motors**
Overhauling load ..... **450 horsepower-torque**
Application: Decelerate the system to a low speed or to rest.

EXAMPLE I: Deceleration by "plugging," using the 125% secondary ohm (Point 2) "plugging" curve (Fig. 6A).

Average torque from 100% to 0% speed	$\frac{160 + 80}{2} = 120\%$
Average motor shaft horsepower-torque	1.2 x 300 x 2 = 720 hp-t
Average retardation horsepower-torque	720 — 450 = 270 hp-t
Time to decelerate (10% per second assumed)	10 sec
*Energy to resistor from load	720 x 10 x 0.5 = 3,600 hp-sec
Energy from line to resistor	720 x 10 = 7,200 hp-sec
Total input to resistor (Fig. 6B)	3,600 + 7,200 = 10,800 hp-sec
**Input from line	7,200/.93 = 7,750 hp-sec

*Assume that total energy from the load is dissipated in the resistor.
**Assume electric efficiency of 93%.

EXAMPLE II: Deceleration by modified form of "plugging" using two motors in opposition. Deceleration effected on Curve 3, Fig. 7A. Retardation from 100% to 15% speed.

Average torque, Curve 1	220%
Average torque, Curve 2	14%
Average torque, Curve 3	206%
Average shaft horsepower-torque (both motors)	(2.2 + .14) 300 = 702 hp-t
Average braking horsepower-torque (average of Curve 3)	2.06 x 300 = 618 hp-t
Hp-t available for deceleration	618 — 450 = 168 hp-t
Relating deceleration rate to calculations, EXAMPLE I	10 x 168/270 = 6.23% per sec
Time to decelerate from 100% to 15% speed	(1.00 — .15) /.0623 = 13.65 sec
Considering the braking or "plugged" motor only (Fig. 7B):	
Energy to resistor from line	2.2 x 300 x 13.65 = 9,010 hp-sec
Input to motor from line (assume 93% electric efficiency)	9,010/.93 = 9,700 hp-sec
Energy from overhauling load to the resistor	$\frac{660 + 99}{2}$ (13.65) = 5,180 hp-sec
Total energy from "plugged" motor into the resistor	9,010 + 5,180 = 14,190 hp-sec
Considering the "bucking" motor only (Fig. 7B):	
Energy to resistor from line	35.7 x 0.5 x 13.65 = 242 hp-sec
Input from line (eff. 93%)	42 x 13.65/.93 = 617 hp-sec
Considering both motors:	
Total input from line	9,700 + 617 = 10,317 hp-sec
Total input to resistor	14,190 + 242 = 14,432 hp-sec

EXAMPLE III: Deceleration by DC dynamic braking. Retardation from 100% to 15% speed (Fig. 8A).

Average DC excitation for 125% peak braking torque	9 kw (both motors)
Average braking torque	660 hp-t
Average retardation, hp-t	660 — 450 = 210 hp-t
Relating decelerating rate to calculations, EXAMPLE I	210/270 x 10 = 7.78% per sec
Time to decelerate from 100% to 15% speed	(1.00 — .15) /.0778 = 11 sec
Input from line to excitation m-g set (assume 85% efficiency)	9 x 11/.746 x .85 = 155 hp-sec
Energy from overhauling load to resistor (Fig. 8B)	$\frac{660 + 99}{2}$ (11) = 4,170 hp-sec

Various Electric-Braking Systems

Method of Braking	Deceleration, % Speed	Time, Sec	Input from Line, Hp-Sec	Energy to Resistor, Hp-Sec
EXAMPLE I: "Plugging"	100% to 0%	10	7,750	10,800
EXAMPLE II: Modified dual-motor "plugging"	100% to 15%	13.65	10,317	14,432
EXAMPLE III: DC dynamic braking	100% to 15%	11	155	4,170

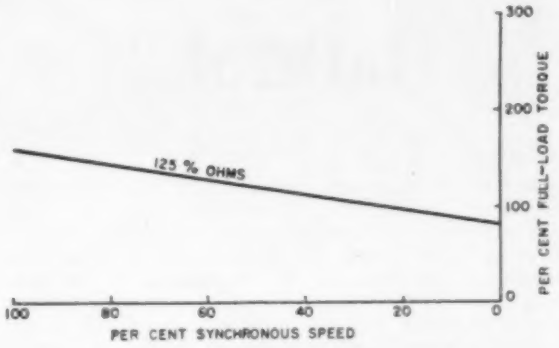


FIG. 6A—REVERSE POWER BRAKING by "plugging," Example I.

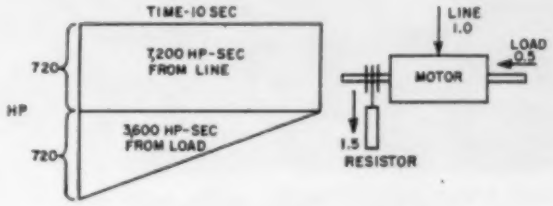


FIG. 6B—ENERGY to resistor in "plugging," Example I.

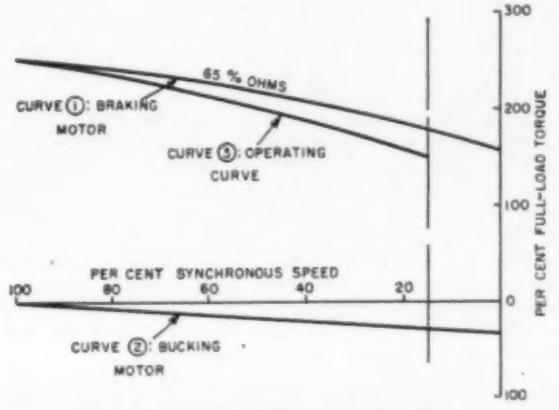


FIG. 7A—REVERSE POWER BRAKING by modified "plugging." Example II.

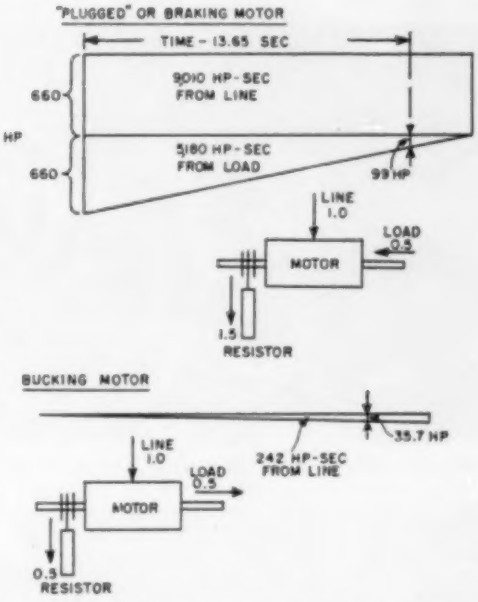


FIG. 7B—ENERGY to resistor in modified "plugging," Example II.

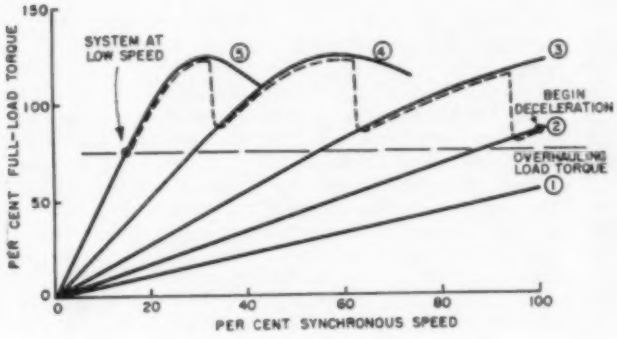


FIG. 8A—DC DYNAMIC BRAKING in operation, Example III.

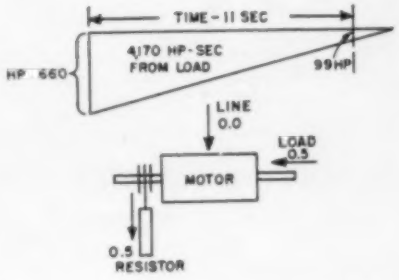
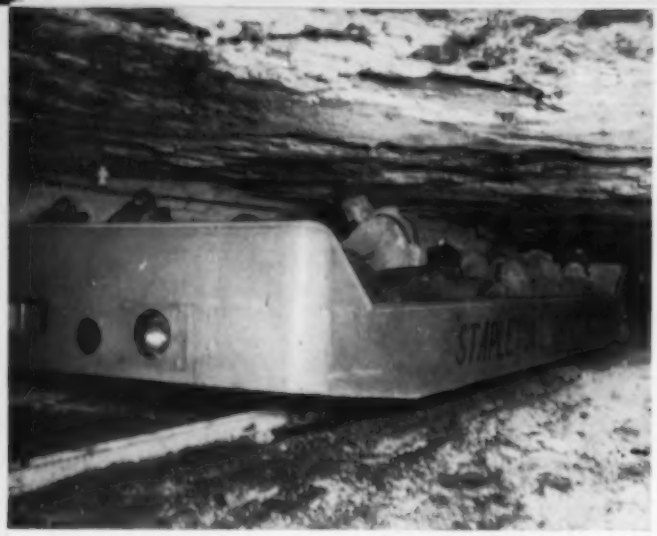


FIG. 8B—ENERGY to resistor, DC dynamic braking, Example III.



UNIT CREW rides to working section in its own car at Hendrix mine. The 24-in-high jeep is designed to eliminate delays and complications and save man-trip time in moving men over track with 36-in clearance.



"BATHTUB" JEEP, with 11 men inside and room for one more, saves tying up locomotives for man-trip.



SIDE VIEW OF FIRST CAR. Two more cars now on order will have trolley poles at each end, for greater safety, and will be equipped with hydraulic brakes.

"Stapleton's Bathtub"

PROVIDING EACH UNIT CREW with its own transportation vehicle has been a goal of Wm. Stapleton, superintendent, Hendrix mine, Consolidation Coal Co. (Ky.), Div. of Pittsburgh Consolidation Coal Co., Deane, Letcher County, Ky. Now, with one unit crew so equipped and the advantages demonstrated, Mr. Stapleton is on the "one-yard line." The new 12-man low-coal jeep in use at Hendrix reminded a local wag of a bathtub, with its ends shaped comfortably for reclining. As a result, it has been dubbed "Stapleton's Bathtub." Since this article was prepared, Mr. Stapleton has joined the staff of the Clinchfield Coal Corp.

The mine is operated with off-track equipment but the section where the jeep is used has track for transportation of supplies and men even though the coal is hauled to the outside by belt. Seam thickness averages 42 in and the top is usually a strong blue sandy shale. Roof clearance maintained on tracked entries is 36 in above the top of the rail.

Original equipment for hauling men and supplies in this section of the mine consists of 8-ton trolley locomotives and large flat cars. It would be prohibitive for each unit crew to have a flat car and locomotive, with such an expensive equipment unit as a locomotive lying idle most of the time. In addition, there would be the delay and complications of switching the locomotive around the car for the return trip at the end of the shift, as well as the extra track work needed. The new car not only is far more comfortable but saves considerable man-trip time, which was the clinching argument for the investment.

"Stapleton's Bathtub" was built by the Lee-Norse Co. Over-all dimensions are: length, 13½ ft; width, 7½ ft; height above the top of the rail, 24 in; gage, 42 in; and wheelbase, 48 in.

The drive consists of two General Electric 3-hp 250-v DC motors, both mounted between the axles and on the same side of the car. A roller chain from each serves as an independent drive to the closest axle. Contactor control is used, with the control handle (reversing) of the dead-man type.

Mounted beside the brake wheel is an electric horn button and a safety switch to cut power off the car. There are two 6- to 8-v resistor-type headlights and a red tail light at each end. A mechanical brake is used on this first car, but the two more cars on order will have hydraulic brakes. The newer cars also will have two trolley poles, one at each end, instead of the present center pole. Use of an end pole will permit the pole and trolley shoe always to trail entirely outside the car, thus being safer for the men.

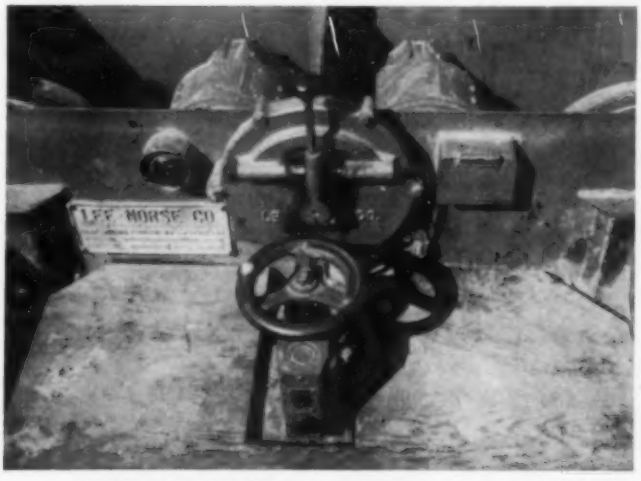
The control cab, at the center, is floored with plywood while the reclining slopes at the ends are floored with rubber matting. The men lay their heads sidewise, on plastic-covered cushions across the upper ends of the cars, and keep below the top edge of the car. Use of 16-in wheels and coil springs makes for easy riding.



COMFORTABLE RIDING in low coal. Men lay heads on plastic-covered cushions. Slopes are covered with rubber matting, while control cab is floored with plywood. Coil springs and 16-in wheels ease riding.



CAR ENDS are identical, with coupling recess, two headlights and a red tail light on each.



COVER REMOVED to show the two motors, each driving a separate axle. In front are controller, brake wheel, light switch, horn button and master cutoff.



Belt From Idler Better for Switch

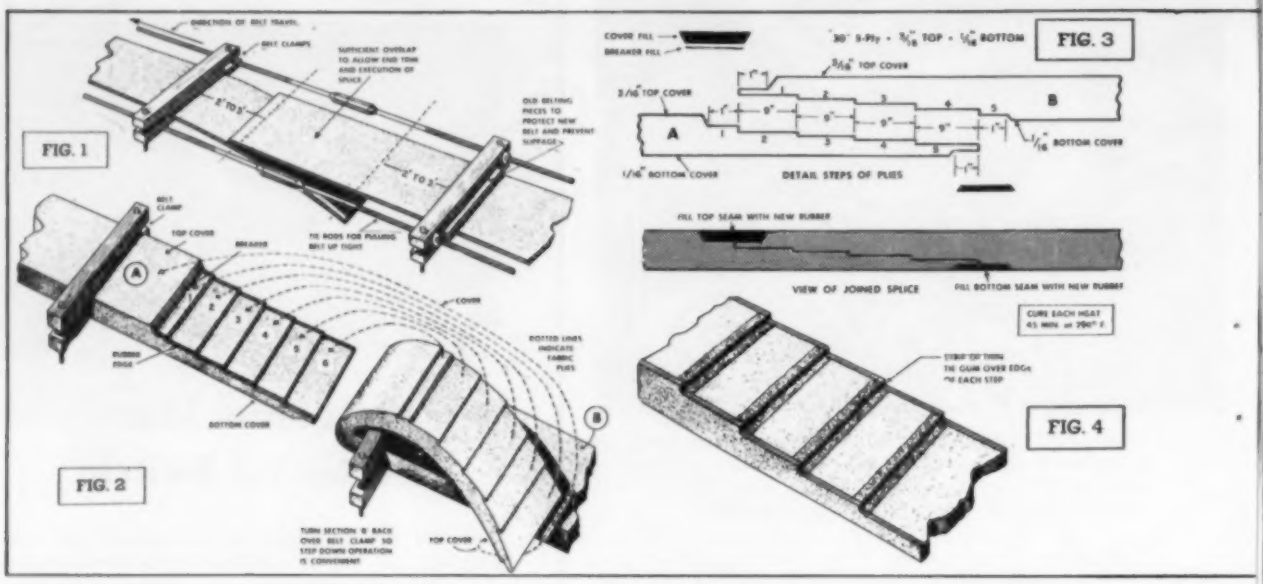
DRIVING centrifugal belt switches by a V-belt from a flat idler has proven a trouble-free method in mines of the Russell Fork Coal Co., Inc., Praise, Pike County, Ky. Previously, the company used a spring-loaded arm with a friction wheel, shaft, bearing and pulley at the end. Trouble developed from slipping of the friction wheel when it became worn and the belt was wet, as well as from bearing wear, weakened springs that provided insufficient pressure and, even, an occasional turning over of the arm.

The installation shown above is on an underground conveyor, but near the discharge end in the mine-car loading tipple outside the portal. On the other underground conveyors in the mine, the switches are belted to the retur idlers. In the installation photographed, a flat re n idler was added to the loaded side close to a troughing idler to bring the centrifugal switch up to a convenient position. Homer Stone, belt mechanic and welder, devised the idler-drive arrangement.



No Groping Here!

THERE NEED BE NO HESITATION here in blowing the piercing siren which warns men working nearby that empty railroad cars, being lowered by gravity, are out of control. The arrows and attention-arresting signs, clearly identifying the signal switch, are located under the Olyphant breaker of The Hudson Coal Co., Olyphant, Pa.



How to Splice Conveyor Belts

By A. F. MATHEIS
Assistant Vice President
Thermoid Co., Trenton, N. J.

CAREFUL ATTENTION to conveyor-belt splices will add to belt life and prevent failures. In selecting the splicing method you'll use—metal fasteners or vulcanizing—consider the service you expect the belt to endure. Don't pick a light-duty splice for a heavy-duty application. Remember that the splice is always a danger point. Following these rules will reduce the chance of failure.

METAL FASTENERS

Most conveyor belts are joined with metal fasteners of various types because they are easy to install and need few special tools or skills. For light and medium service, staple-type fasteners are excellent. They are applied by driving and clinching staples or by using individual split rivets. Although fasteners of this type fit tightly in the holes they make in the belt, it is a good idea to seal the holes with rubber cement to prevent moisture from reaching the carcass. When fine bulk material such as coal, sand, etc., is carried, a strip of light duck or herringbone tape under the fasteners will prevent fines from sifting through.

Hinge-pin fasteners are particularly suited to flat belts and package conveyors. Heavy-duty service requires double-plate bolted fasteners. Punched holes no larger than a close fit for the bolts are necessary for this type of fastener, and the insides of the holes should be carefully cemented before inserting the bolts to keep water from the carcass. Determine and observe the manufacturer's recommendations on size and application.

VULCANIZED JOINTS

Extremely high tensions resulting from relatively long centers and high lifts require the vulcanized splice. A vulcanized splice also is advisable for conveying wet materials or for operation in a moist atmosphere. Since vulcanized splices last longer and don't require as much maintenance and inspection as metal-fastener splices, vulcanized splices should be used in inaccessible places such as mines and tunnels or in installations where a splice failure would seriously interrupt production. High-temperature applications require a vulcanized joint because metal fasteners transfer heat rapidly to the inner carcass and may cause charring that leads to early failure.

PRELIMINARY SPLICING STEPS

Once the type of belt splice is decided on, here are the steps to follow:

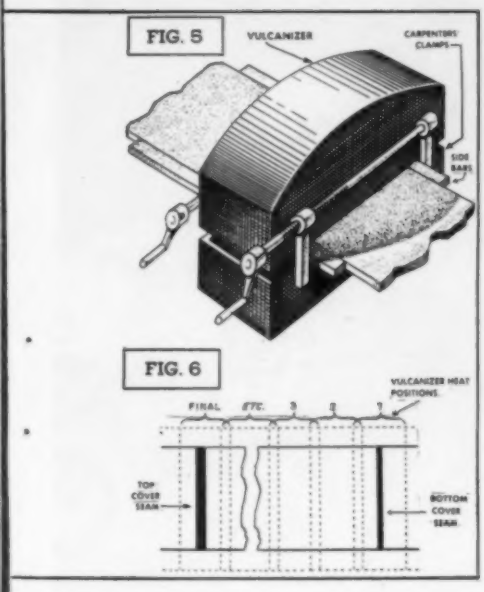
Mount the roll of belting on a strong stand at the point of installation, unwinding the belt from the top of the roll. Make sure that the correct side will be carrying the load when the belt is spliced. Since some manufacturers indicate the direction of forward travel, check that. Slacken off the take-up mechanism of the belt carrier as far as it will go to allow for belt stretch.

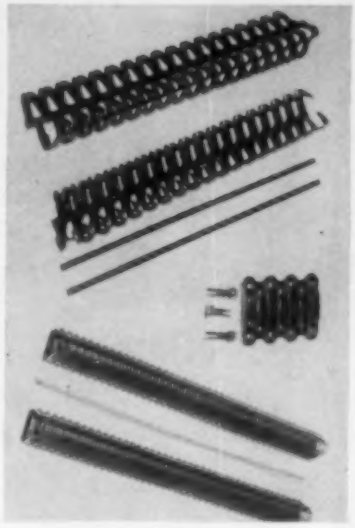
Then select the best spot to make the splice, with an eye to sufficient headroom, elbow-room, light, safety, ventilation and dryness. Remove enough carriers at the point selected to make room for the auxiliary equipment required.

If a light-duty belt is being installed, the belt ends can be pulled together by a block and tackle applied through holes punched 3 in from the end of the belt. A heavy belt requires a bolted clamp, to which the block and tackle is attached. The ends should be brought together slowly with constant checking at all points to make sure the belt is not snagged, creased or subjected to any damage. Pull the belt together until the ends overlap enough that the holes punched for the block and tackle can be cut off. Apply the bolted belt clamp 3 ft from one end of the belt and as far as it reaches on the other end. Remove all slack by tightening the long clamp bolts. Protect the surface of the belt under each bolt with strips of old belting, which also prevents the clamps from slipping.

INSTALLING METAL FASTENERS

Before any cutting or hole punching is done, be sure that the belt is dry. Mark a center line along the





Typical Metal Fasteners

cover at each end of the belt and then mark the ends for cutting at right angles to the center line, using a steel square. Belt edges are not reliable guides for squaring. Use a sharp knife and cut the belt ends so that they just meet. Apply rubber cement immediately to the cut ends to keep out moisture and prevent mildew. Install the metal fasteners and make sure they are as tight as possible. Then remove the clamps and restore the carriers to their original positions. Move the belt slowly, after first checking the belt for tools and other extraneous materials that may have been left on it by accident. After running the belt without load, check the splice. It sometimes is possible to tighten the double-plate bolted-type fasteners more after the belt has been run for a short time.

VULCANIZING SPLICES IN THE FIELD

In general, the same preliminary steps are followed in vulcanizing a splice as in using metal fasteners. It is particularly important, however, to eliminate moisture and foreign material when vulcanizing joints. Use an infra-red lamp or similar heating unit if moisture is present, but do not heat above 250 F.

After the belt has been brought into position as shown in Fig. 1, the next operation is the preparation of the steps of the splice itself. Note that the Belt Section A lies below Section B and that the direction of travel the belt will take also is shown. The steps on Section A should be developed from the top down so that when the splice is completed and the belt is in operation, the whole splice will pass over the pulleys before the exposed seam. This progressive support as the belt goes over the pulleys prevents both fraying and concentrated stress.

As shown in Fig. 2, start with Section A and step back each element, working from the top side down through the entire belt construction to permit most accessible working conditions.

Section B should be marked for the matching point of the first ply of splice contact with Section A and then turned back over the belt clamp so that the stepping-down operation can again be accomplished from exposed side down.

You will notice that Section A is started by stripping the top cover first and working step-by-step through the belt. Section B because the belt is turned back upon itself, is started by stripping the back cover and working up through the plies to top cover.

Fig. 2 shows each step and the joining arrows indicate the matching positions. Fig. 3 is a dimensional drawing showing exact distances for each element of the splice.

JOINING THE BELT

After the Sections A and B have been stepped down, the next operation is the preparation of surfaces to be joined.

1. With coarse emery cloth, scrape over the steps of each end and cut edges of the covers and clean them thoroughly with carbon tetrachloride.

2. Be sure the fabric plies are dry and free of moisture.

3. Cement all steps of Sections A and B with cement. Permit the cement to dry thoroughly and then apply a second coat.

4. After the cement has dried, place 1- to 2-in wide strips of thin tie gum over the edge of each step (Fig. 4).

5. Physically join the splice, taking care that all surfaces and abutting edges are aligned. Be careful that no air is trapped between Sections A and B during this operation.

6. If a breaker is present, set in a strip of breaker 4-in wide to abut against the edges of the stepped-back breaker in Sections A and B. Cement and permit to dry.

7. Fill in the space remaining between the covers with stock, skiving the exposed joining edges. Cement belt edges and apply a thin cover stock over the exposed seam.

VULCANIZING THE SPLICE

The number of heats necessary to vulcanize the belt depends upon size of vulcanizer used and the developed length of the splice. Cure will vary from 30 to 45 min at 290 F, depending on type of belt, etc.

The first heat should overlap the bottom seam by approximately 3 in and each heat thereafter overlap the preceding heat by 2 in. The final heat again should overlap the seam on the top cover by approximately 3 in. When setting up the vulcanizer, metal side bars the same thickness as the belt must be used to confine the edges during curing. Carpenter clamps on both sides of vulcanizer should be used to control position of side bars.

After splice is vulcanized, trim the rubber that may have flowed out on the edges. Figs. 5 and 6 offer general information on operation of the vulcanizer.

SPECIAL TIPS ON SPLICING

In tearing down the steps, care must be used not to cut into the fabric ply below the one being removed for each step.

Best procedure for ripping off steps is to turn back 1 to 2 in of the ply being removed across the belt and cut nicks in this turned-back edge every 2 in. It will then be possible to grab each 2-in strip with pliers and tear free for entire distance required.

Rubber should be removed in similar strips. It will not rip, but must be cut progressively with a knife.

Success of a field splice is largely dependent upon good workmanship, care and precision. Consequently, these factors should receive primary consideration.

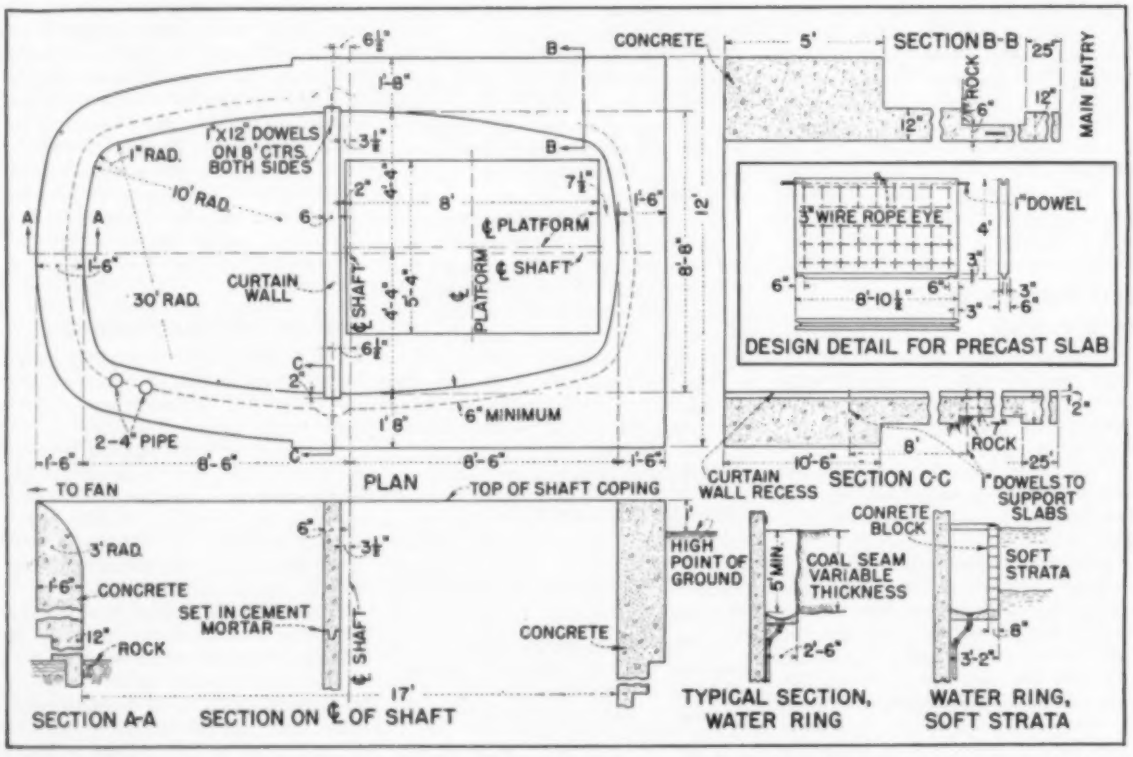


NEW SHAFT features tongued and grooved precast concrete curtain wall, will serve as ventilation shaft, portal and escapeway.



REINFORCED tongued and grooved slabs were made at the shaft site by the contractor's regular crew. Slabs, measuring 4 ft by 8 ft 10½ in by 6 in, were stockpiled until needed in the shaft.

Speedy Shaft Construction



CONSTRUCTION DETAILS for Crucible's new airshaft and escapeway, with design of precast slabs shown in inset.



SPECIAL SLING was made to support slab from bottom as it was lowered into position in the keyway.



WIRE LOOP incorporated in slab was used to position slab after it was lowered by a special sling.

PROBLEM: How to build a leakproof, strong 6-in wall in a new mine shaft.

SOLUTION: Precast reinforced concrete slabs, made and set by the regular shaft-construction crew.

RESULTS: Installation of 397 ft of wall in nine shifts with real savings in cost.

PRECAST tongued and grooved concrete slabs speeded construction and reduced the cost of a curtain wall at the new Carmichaels shaft of the Crucible mine of the Crucible Steel Co. of America, Crucible, Pa. Substituted for a standard 8-in brick or concrete block wall, the 1½-ton slabs were installed in the 397-ft shaft in nine work shifts.

The new shaft with its unusual dividing wall is the result of Crucible management's desire to provide a second escapeway from an active area in a newly leased tract of coal. Management's first thought was to try putting down a 48- or 60-in core-drill hole as an escapeway, using a standby cylindrical bucket and suitable hoisting equipment for use in any underground emergency. As plans began to crystalize early in 1952, it became apparent that there were many advantages to having an exhaust ventilation fan in that immediate area.

After further development of the ventilation possibility, management realized that it would be impractical to have an exhaust system using a circular hole and at the same time use the hole for an emergency escapeway. Another factor contributing to the elimination of a large hole was that 100,000 cfm of air was desired underground and the water gage required to deliver this quantity would have



SHAFT KEYWAY was included in lining when concrete was poured.



STEEL PINS, 1 in in diameter, extend into shaft lining and take part of load.



SMOOTH JOINTS in wall resulted from uniform slabs joined with mortar.

been too high. As a result, efforts were directed toward planning a larger opening to be sunk by conventional methods.

Further study indicated that by enlarging the proposed shaft beyond the ventilation requirements, a suitable elevator could be installed and the opening could be a combination portal, ventilation shaft and escapeway. With this in mind, the proposed plans were enlarged to include a small, modern high-speed elevator that would satisfy the requirements for an escapeway.

To accommodate the elevator, the design of the shaft was changed to an eliptical form with a curtain wall separating the elevator hatchway from the return air side. To economize on space and expense, the thickness of the curtain wall was limited to 6 in as compared to a normal thickness of 8 in.

The next step was to develop a method of putting in an airtight 6-in wall. As a result of conferences and discussions between engineers and operating personnel, Crucible management decided to try prefabricated tongued and grooved concrete slabs fitted into keyways or recesses in the shaft lining. The recesses were to be provided by attaching beveled 2x8-in timbers to the shaft-lining forms at the position where the curtain wall was to be installed. An offset was made in the concrete forms behind the keyways to provide a minimum of 6 in of concrete throughout the shaft lining.

Key roles in the final design and construction of the shaft and curtain wall were played by T. P. Latta, former superintendent, and C. B. Tillson Jr., present superintendent, at Crucible mine; the Fayette Engineering Co., Uniontown, Pa.; and the R. G. Johnson Co., who were the shaft contractors.

SLAB DESIGN

Final design of the slabs called for them to be 4 ft by 8 ft 10½ in by 6 in in size with one long side tongued and the other grooved, and each end to be grooved. To provide strength, ½-in reinforcing rods on 12-in vertical and horizontal centers were incorporated in slab design.

Slabs, made of high early strength cement, required ⅔ yd of concrete and each weighed about 1½ tons when ready for installation. A piece of looped ¾-in wire rope was welded to the reinforcing in the concrete and the loop extended out of the top of the edge with the groove. At first this was planned as a method to lower the slab, but was rejected in favor of a special sling that supported the slab from beneath. However, the loop was used for final positioning of the slab and removal of the sling.



KEY MAN and leader at Crucible's mine is C. B. Tillson Jr., mine superintendent.

BUILDING THE WALL

No attempt was made to start erection of the wall until all work at the shaft had been completed. While work in the shaft was being completed, the concrete slabs were being poured and stockpiled during periods when the entire construction crew could not be used in the shaft area. Thus no extra manpower was required.

A special sling consisting of two rods welded to strips of sheet steel and having two rope supports was used to lower the individual slabs, swing them over the shaft and slide them into the keyways left in the shaft lining. These grooves had ¾-in clearance between them and the slabs. Blocks were lowered with tongue down by the derrick used on the construction job.

A second independent hoist was used to lower two or three men whose duties were to remove the special sling, position the slab, using the wire-rope loop, cut off the rope loop, pour the mortar in the groove and fill the clearance space and grooves at each end of the block. When the work was completed on one slab, the men were lowered to the shaft bottom where they withdrew a safe distance while another slab was lowered. The curtain-building crew worked from the shaft bottom until construction had reached the midpoint. Then the blocks were lowered first and the crew followed to position them. Cutting the built-in loop from the groove was done by one man using a cutting torch while the other crew members filled the grooves with mortar. No time was lost while the cutting operation was carried out.

Between each two successive blocks, a steel 1-in round pin, flattened on one end, was inserted into a 6-in-deep hole drilled into the shaft lining. A similar length extended into the groove of the slab. These pins were installed to prevent the bottom block from taking all the weight of the blocks above.

In lowering slabs into the shaft, it was found that vibrations were set up in the sling and blocks frequently became fouled approximately 200 ft below the shaft coping. When this happened, workmen were lowered to the trouble spot where they pried the slab loose without serious trouble.

A two- or three-man crew, working from a platform lowered by the auxiliary hoist, did all the work necessary in placing the slabs. No additional men were added to the construction crew since all slabs were lowered by the regular hoisting engineer who was assisted by a top man, who also operated the auxiliary hoist. This crew was able to set an average of 11 slabs per shift, with a maximum of 18 being placed in their best shift. Only nine shifts were required for the erection of 397 ft of concrete curtain wall. When the wall had reached a point where a full slab could not be used, a concrete form was made and fitted in the remaining wall area and concrete was poured.

SEALING THE WALL

After all slabs had been placed, the corners on the upcast and downcast sides of the wall were coated with a sand-cement mixture to completely fill all voids. This was done as an added precaution against air leaks, even though both ends of the block had been very carefully tamped with mortar at the time of installation. There have been no indications of cracks or leaks since the job was completed in July.

Scheduled for the future at the new shaft is installation of a high-speed elevator for lowering men to the working area. The elevator, on order and scheduled for initial operation early in 1954, is a standard hospital type with end opening and an 8-ft by 5-ft 4-in platform that will accommodate a stretcher patient. Other facilities planned at the new opening are a new lamphouse, first-aid receiving room, pay office, compressor room and foremen's office—all with an enclosed passageway leading to the elevator—and parking facilities for employees' cars.

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At a large colliery in West Virginia, one set of Kennametal U8R3 Bits cut 1440 30-ft. places at a bit cost of only $.0013 per ton. Previous costs here had been reasonable because of relatively easy cutting conditions, yet use of tough Kennametal Bits not only *reduced* these costs, but produced better coal, with less dust.

Controller repair costs are down 50% . . . power consumption is 15% less . . . cutting time per place has been reduced by 20 minutes . . . cuttings are coarser — there is more pea coal.

Kennametal Bits — the economical answer to *severe* cutting problems — can also effect *extra* savings in ordinary cutting conditions because they stay sharp longer, take harder knocks than any other tungsten carbide. Your Kennametal Representative would like to go into your mine and demonstrate. Call him anytime.



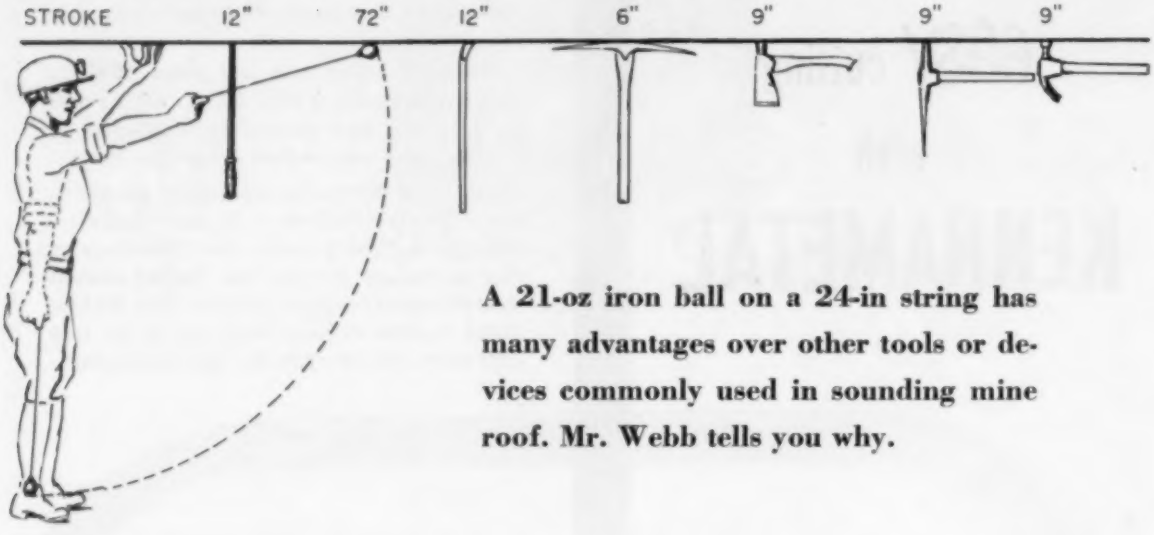
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Foremen's Forum



A 21-oz iron ball on a 24-in string has many advantages over other tools or devices commonly used in sounding mine roof. Mr. Webb tells you why.

Better Roof Sounding

By CHESTER WEBB, General Inspector
Eastern Gas & Fuel Associates, Mount Hope, W. Va.

CONSIDER THESE FIVE FUNDAMENTALS of sounding roof.

1. All sound arises from motion of matter. Any matter giving off sound has been put into motion, be it a liquid, a gas, or a solid such as mine roof.

2. With a light tap and a light instrument you can start a drumhead vibrating. Likewise, with a light sounding device and a light tap you can start a thin band of slate vibrating.

3. To set up vibrations which will produce audible sound waves from a large piece of rock requires the expenditure of much more energy. A much harder blow and ordinarily a much heavier instrument must be used.

4. In sounding heavy top with a light instrument we hear the sound waves from the vibration of the device and the point of contact—not the slight waves produced by moving roof. These extraneous sounds drown out the sound of the roof and deceive men into thinking the loose heavy roof is solid roof.

5. The common sounding devices used in coal mines may be adequate for sounding thin loose roof which is not so dangerous, but they are not suitable for sounding large or heavy pieces of loose roof.

Why put so much emphasis on heavy roof? Because heavy roof is most often misjudged and is the cause of most roof fatalities. Thin roof is easily judged and is not so likely to result in fatalities.

U. S. Bureau of Mines Information Circular No. 7605, in reporting the study of 263 roof-fall fatalities in 1950, says: The 220 pieces of roof rock that fell averaged 12 ft in length, 8 ft in width and 1 ft in thickness. The largest piece was 103 ft long, 25 ft wide and 3 ft thick. The smallest was 32 in long, 18 in wide and 4 in thick.

The smallest was 4 in thick. For this kind of roof we carry around little steel slate bars and wooden sticks with which to sound the top. What do we use for sounding roof which averages 1 ft in thickness. We use the same little bars and sticks with the same gentle "tap, tap, tap" which we use for sounding roof 4 in thick to feather edge!

It might as well be admitted that the writer is contemptuous of roof sounding. The bulk of his mining experience has been in bad top, and long ago he decided, "All doubtful roof should be supported, and the hell with roof sounding!" For the sake of politeness, the statement should be modified to this extent: "Tap the roof lightly the first time. Then if it appears solid, hit it as hard as possible. If it isn't absolutely solid, support it!"

BEST SOUNDING DEVICE

But since we always have, still do, and probably always will sound roof, let's do it to the best of our ability and with the best device available.

Now, with what device? A penny, nickel, dime and quarter are all monetary coins but they are not of the same value. We use iron bars, wooden sticks, picks, hammers, screwdrivers and numerous other articles for sounding roof, but they are not equally effective. One and one only of these devices is BEST. We are betting our lives on judgment that is based on the use of a sounding device. Why not use the best device?

We will not bother to debate which of the customary sounding devices is best. We simply contend that a metal ball with a string tied to it is a better roof-sounding device than any of the usual ones in use today.

Why is the metal ball better? For sounding heavy roof we need facilities with which to strike a hard blow in order to set the roof in motion. We know we can't strike a hard blow with a feather so obviously we need an instrument with sufficient weight in reasonable size. Here are the weights of some devices most

Adapted from *The Safe Mine Foreman*, January, 1954.



Thermoid Hose designed specifically for use in mines

Thermoid
Industrial Rubber Products
Quality Service

Thermoid designs and manufactures many types of hose built to give longer service and lower operating costs in a wide variety of specific applications. These 3 are ideal for rugged mining work:

THERMINE — Heavy duty air hose, mandrel-built with oil resistant tube reinforced by high tensile yarn. Smooth, abrasion-resistant cover.

THERMOFLEX — Mandrel-built air hose for extreme service and direct connection to compressors. Smooth, black, abrasion-resistant cover.

#325 SUCTION HOSE — For heavy duty water suction service. Smooth bore, wrapped hose with heavy wire reinforcement, durable cotton duck plies.

Thermoid research is responsible for new, better construction that makes Thermoid hose more durable . . . easier to handle. Your Thermoid Distributor can help you select the hose best suited for your requirements. Or if you prefer write direct for catalogs.



Conveyor & Elevator Belting • Transmission Belting
F.H.P. & Multiple V-Belts • Wrapped & Molded Hose

Thermoid

Rubber Sheet Packings • Molded Products
Industrial Brake Linings and Friction Materials

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

commonly employed for roof sounding:

Iron ball, 2 in in diameter with 24-in string	21 oz
Iron bar, ½x24 in	20 oz
Wooden stick, 1x24 in with metal cap	16 oz
Prospector's pick with wooden handle	12 oz
Claw hammer	24 oz
Hatchet	32 oz
Coal pick	4.5 lb
Slate bar	13 lb

But weight alone is not sufficient. We must also have the energy to move the weight. Furthermore, the energy must be expended quickly. It would be useless to press a heavy body against the roof for this would not cause the roof to vibrate. Therefore, we know the device must be struck against the roof with a swing or stroke.

We estimate the average stroke used by various men with the different usual devices to be from 6 to 12 in. Of course, it is possible to take a longer stroke and apply more force, but why bother with this possibility if it isn't customarily done?

MORE STRIKING POWER

On the other hand, in 6 ft of height the metal ball travels in an arc of more than 6 ft, which is a 12 to 1 ratio over the customary 6-in stroke of the pick. The usual 12-in stroke with the short stick or bar gives the ball a 6 to 1 ratio.

Of all the customary devices, it would appear that the pick, being the heaviest, would come nearest to being a suitable sounding device. Other than the advantage of weight the pick has all the disadvantages of the other devices. In addition, if the handle protrudes through the eye of the pick the wood provides a cushioning effect against the top.

We must not forget that when we strike the roof we want to hear the sound of the roof, not the sound of the device. Consider the ringing of the tool itself which so often drowns out the faintly audible sound waves produced by the vibration of heavy roof: the two points of the pick, the tapered sharp blade of the hatchet, the long slim point of tool steel in the prospector's pick and the two claws of the carpenter's hammer. Although the wooden stick does vibrate, ordinarily it does not produce enough vibrating sound to drown the sound of the roof. The objections to the stick are that it is too light in weight to set heavy roof in motion and it tends to muffle the sound produced on contact with the roof.

NO EXTRANEOUS SOUND

The solid metal ball, without projecting parts to vibrate and ring, is the device which will least of all produce enough sound to drown out the sound of the roof. It is natural to ask, "Won't the string on the ball vibrate like a banjo string?" In the illustration you will see that the ball strikes the roof on the backward swing of the arc. As the ball strikes the roof the hand is in motion and will continue in motion, thereby slacking the tension in the string. In hundreds of tries I have not been able to hear the string vibrate.

Ringing caused by the vibration of the tool itself is not the only misleading sound. The point of contact also is a serious factor to be considered. It is only necessary to clap your hands together to realize that when two flat surfaces come together the layer of air between them must move and in so moving produces sound. The round iron ball has less striking surface and air moves much easier around it, thus producing less contact sound to drown out the sound of the roof.

This being true, it might appear that a sharp pointed bar or the wedge-shaped tip on a wooden stick, having even less contact surface than the ball, might be better designs for sounding roof. Actually, the happy medium has been passed. We would not consider beating a drum with the point of an ice pick because the drumhead would be penetrated. The sounding device ordinarily does not penetrate the roof as would the ice pick in a drumhead, but nevertheless there is penetration, which rules out the sharp point as a sounding device. The happy medium between a flat surface and a point appears to be the curved surface of a ball.

The usual devices used for roof sounding may muffle the very vibrations we wish to hear. When we jab straight up at the roof, as we do with these devices, our hand is gripping the handle in upward motion. At the moment of impact, the device suddenly stops but our hand does not. It continues on up the handle various distances and holds the tool against the roof to retard vibration. To a degree we defeat our intentions.

Not so with the metal ball. Upon striking the roof the ball continues upward as far as the elasticity of the roof permits and as the roof rebounds on its first return vibration the ball bounces away because it is free to rebound.

SAME DEVICE, SAME SOUND

Due to the labor or inconvenience of carrying around a special device for sounding roof, many supervisors rely upon finding some miscellaneous device where and when the need arises. In a single shift he may use any or several of these devices. As a result of the various extraneous sounds produced by these devices, he has no basis for comparison between solid roof and heavy roof. It is possible he might have been better off had he not deceived himself.

Because the metal ball is easier to carry the objection to carrying a sounding device would be greatly overcome. Furthermore, the supervisor would have a device which would give very little and unvarying extraneous sounds. In a seam so low that a man must crawl, the ease of carrying the ball in a pocket is a decided advantage.

The workman most often sounds the top with a pick because this is the most likely tool at hand. Small scales he discovers while sounding with a pick are most often also pulled with the pick. He is told not to do this, he should not —but he does. His other common devices are slate bars, axes and rock hammers. All three together are not used as often as the pick for sounding roof.

The majority of supervisors carry either a metal bar or a wooden stick with a metal tip. Usually the bar is pointed or wedge-shaped at one end for pulling loose slate. The wooden stick often is tipped with a metal wedge. For the past several years in our company, the sounding sticks have been fitted with a flat-headed metal cap. No point is provided for pulling slate because:

1. We believe a short bar or stick should not be used for pulling slate.
2. These sticks are provided only for sounding roof.
3. We believe our foremen are wasting their supervisory time by pulling at small unimportant roof scales or fooling with a piece of slate large enough to require regular slate bars.

ADVANTAGES OF THE BALL

In short, none of the customary roof-sounding devices is appropriate for pulling slate and neither is the metal ball. The main difference is that the ball prevents the attempt.

Occasionally a man is struck by falling slate as he sounds the roof. With the ball, the nearest he is likely to be to the point of contact is 2 ft and the farthest, 4 ft. At least he has a greater margin of safety.

And even though the ear may be farther from the point of contact with the roof when using the ball, the harder blow of the ball produces vibrations of greater amplitude or loudness. If the audible sound waves from the roof are so faint that they cannot be heard within 3 ft (using the ball), it is almost certain that extraneous sounds from other devices would drown out this roof sound anyway.

Feeling the roof during testing will not tell you more than you have already heard. Yet, the writer favors the "touch" system because in hearing and feeling the looseness in the roof you will be twice warned that it is dangerous. You can always place the fingers of one hand within 2 ft of the point of contact with the ball and the roof.

Incidentally, if the string should come into contact with the trolley wire it would not present the shock hazard that occurs with a metal bar.

Nothing is perfect including this ball method of sounding roof. Roof sounding at its best is a crude way of guessing between life and death. Everyone to whom I have introduced this idea asks, "Won't the ball come back and hit you?" The answer is yes and no. Your automobile will leave the highway if you steer it off the road. As sure as you swing the ball to strike the roof directly in front of you it will rebound at you. Swing it from the side and it rebounds to the side. The ball could be attached to a stiffer riding crop to overcome this objection, but that would add to the cost, which, with a simple string, need not be more than the cost of other roof-sounding devices.

For example, the manufactured wooden sounding sticks which our company purchases cost over $2 each by the time the metal tip is added. I have not seen a metal bar worth carrying that did not represent more than $2 in labor and materials by the time it was ready to use. The ball with only a string should certainly cost no more than this.

for lower cost control of moderately **Corrosive** fluids



Fig. 2631-A Gate

JENKINS

NICKEL IRON

Valves with Type 316

STAINLESS STEEL

Trim



Fig. 2624 Swing Check

Every part in contact with fluid is the right metal to block corrosion and beat wear.

Cast NICKEL IRON

- **BODIES** Heavy duty, dimensioned for greater resistance to wear and abuse. Through port design in Gate Valves.
- **BONNET** Rugged construction, like body. Swing-type gland bolts. Screwed-in back-seating bushing. Deep stuffing box.
- **YOKE** Integral with bonnet in 2″ to 4″ sizes.
- **WEDGE** In 10″ to 24″ sizes, with Stainless Steel Wedge Rings.
- **COVER** In Check Valve.

Type 316 STAINLESS STEEL

- SPINDLE
- GLAND
- BONNET BUSHING
- SPINDLE RING
- WEDGE PIN
- WEDGE RINGS Rolled into Nickel Iron Wedge in 10″ to 24″ sizes.
- SEAT RINGS
- DISC and HANGER in Gate Valve

NI-RESIST Type No. 2

- WEDGE of I-beam structure is solid NI-RESIST in 2″ to 8″ sizes.

PRESSURE RATINGS

2″ to 12″—200 lbs. O.W.G.
14″ to 24″—150 lbs. O.W.G.

This combination provides corrosion resistance well above the moderate need in many processing services with an investment well below that for all-stainless steel valves.

Designed primarily for the chemical process industries, they are recommended for control of mildly corrosive liquids with minimum quantities of mineral acids, such as creosote in wood treatment, and many liquids carried in petroleum processing.

A major use is in pulp and paper processing, particularly in lines serving the digester, and in the chemical recovery cycle. Service records in lines carrying the valve-punishing "black liquor" give Jenkins Nickel Iron Valves top performance rating.

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JENKINS VALVES

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Operating Ideas

Clocks Time Operation Of Preparation Plant

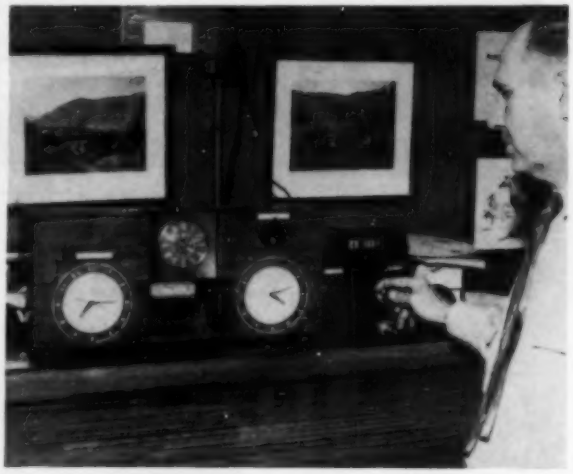
AN ACCURATE CHECK on plant running time is always available in the office of the Gulf Smokeless Coal Co., Tams, W. Va., where four clocks are tied in with the preparation plant at Tams No. 2 mine to show any time lost because of breakdowns or lack of coal.

The device, which was developed by Ed Fisher, an electrician at the Tams mine, is located in the office of Maj. W. P. Tams Jr., company president. It consists of a master clock, which was a gift to Maj. Tams, and three clocks so connected that they record the plant running time. The clocks are enclosed in a box, which also contains a small counter that trips each time a mine car is dumped.

The three clocks are synchronized with the master unit in the morning, and by comparing them with the master clock after the plant closes down for the day, or at any time during the day, the exact time lost can be easily figured.

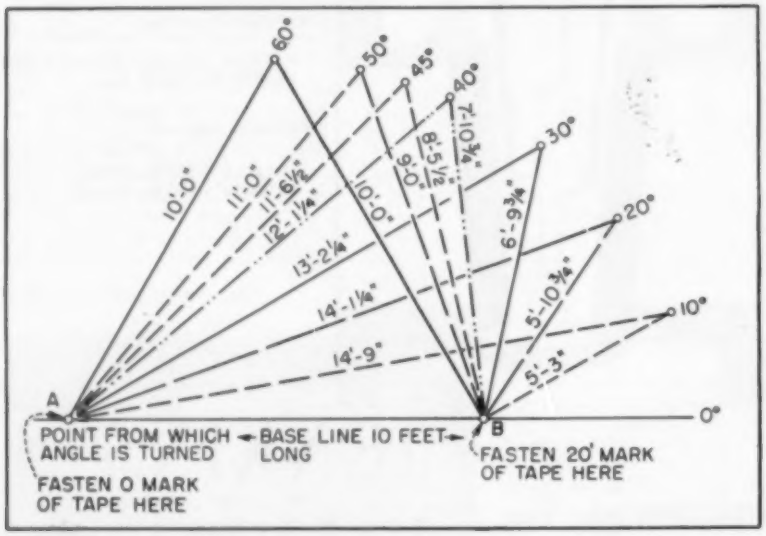
One of the three clocks stops when the cleaning plant ceases operation because of difficulties, machinery breakdowns or other reasons, such as for the lunch period, and starts again when the plant resumes operation. The second, which also is equipped with a red light, shows the time lost because of lack of coal. This clock stops when trips of coal to the rotary dump from the mine are halted and resumes when coal is moving again.

The third clock stops and stays off when the cleaning plant is closed for the day, thus providing an accurate check of any overtime worked. When the plant shuts down for the day, one of the crew throws a switch that actuates a relay in a box connected to the clock. The relay must be closed manually from the office when the clock is reset for the next day's work. Power for all but the master clock is supplied from the cleaning plant, with five wires running from the plant to the office.



THREE CLOCKS in the office of the Gulf Smokeless Coal Co. hooked up to the cleaning plant to record time lost are shown off by W. L. Williamson, company purchasing agent.

How to Lay Off Angles With a Tape



HAVE YOU OFTEN WISHED that you had a simple way to construct various angles underground? If so, this "Operating Idea" submitted by Victor S. Veazey, Pratt, W. Va., is just what you are looking for. By using the accompanying diagram and a 50-ft tape, you can construct most of the common angles you might want to lay out underground. If you must do the job frequently, it may pay you to keep the diagram in your pocket.

Let's suppose you want to turn a breakthrough 45 deg with a heading—here's how to put the diagram to work. First unroll about 25 to 30 ft of your 50-ft pocket tape. Then fasten the zero end to the point in the heading where you want to turn the breakthrough (A in the diagram). Next fasten the 20-ft mark to a Point B which is 10 ft away from A and on the centerline of the heading. Now refer to the diagram and pick out 45 deg and notice that lines lead from 45 deg to Points A and B. The lengths of these lines as indicated are the ones required to make the 45 deg angle.

In the case of the 45 deg angle, the lengths are 11 ft 6½ in and 8 ft 5½ in. Pick up the tape at the 11 ft 6½ in mark, draw it tight in both directions to A & B and then mark the point where it falls. The angle between the baseline AB and the 11-ft 6½-in line is 45 deg. The procedure is similar for constructing the other angles shown in the diagram. To avoid mistakes, always recheck your distance before final stretching of tape.



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THANKS TO BATTERY POWER!

That in a nutshell describes battery-powered shuttle cars and locomotives. With a minimum of moving parts and a vast reservoir of smooth-flowing energy, battery cars and locomotives are *always* ready . . . *always* raring to go at full capacity all day long. Silent, safe and fume-free, there's *no* power like battery power . . . and there's *no* battery power like *Gould* power.



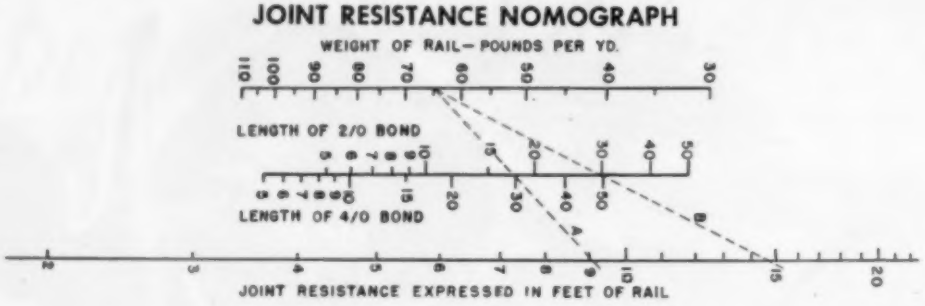
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THE GOULD "THIRTY"
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America's Finest
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TO USE NOMOGRAPH, draw a line through the rail-weight scale and the proper scale of bond length. At the intersection of this line on the joint-resistance scale, read joint resistance. For resistance of a bond of another capacity, determine resistance of 4/0 bond and use the formula at right.

$$Rx = \frac{212 \times R4/0}{Cx}$$

Rx = Joint Resistance; Cx = Bond Capacity (MCM); R4/0 = Joint Resistance of 4/0 Bond.

Nomograph Simplifies Rail-Bond Testing

TO EASE THE JOB of checking rail-bond installations, the engineering staff of the Ohio Brass Co., Mansfield, Ohio, has developed this up-to-date "Joint Resistance Nomograph." As pointed out in the company's publication, *O-B Haulage Ways*, the new chart is free of the many confusing lines included in previous graphs and is very easy to use since it requires construction of only one line. Also, it is corrected for installed terminal resistance.

As an additional aid to bond testing, Ohio Brass also has developed a "Direct Reading Rail Bond Tester" that provides a standard length of rail as a basis of measurement. In using this lightweight one-man device, the operator merely reads the joint resistance from a meter.

As an example of the use of the nomograph, Dotted Line A has been constructed for a 4/0 30-in rail bond on 65-lb rail. Joint resistance is shown to be equivalent to 9.2 ft of rail. Line B is constructed for the same installation with 2/0 bond. In this case, joint resistance is 14.7 ft of rail.

For the sake of simplicity, only two bond capacities are included in the graph. When needed, the joint resistance of a different-size bond may be obtained, at least in part, by using the same chart. The first step is to determine the resistance of the installation, assuming that 4/0 bond is being used. That resistance is then multiplied by the inverse ratio of bond capacities to determine the resistance of the bond in question. This is shown as a formula under the nomograph.

Discretion should be used when employing this graph to determine when a bond should be replaced. If a new bond is equivalent to 9 or 10 ft of rail, the present bond should not necessarily be replaced if it reads 12 ft of rail. Replacement should be given definite consideration, however, if the resistance is approximately double that indicated for a new bond.

A difficult determination in rail-bond installations is the conductivity of the splice bar. This is not figured into the joint-resistance nomograph. While this might seem a serious oversight, actually the conductivity of a splice bar which has been in service for some time usually will be negligible. Since most bond testing is done on old installations, omission of splice-bar conductivity in the nomograph is understandable.

Although the nomograph is primarily for testing bond installations, it can also be used for rail-bond selection. In this, the desired resistance of the joint is determined in the normal manner. A line then is drawn on the nomograph from the determined resistance to the rail weight, intersecting the bond length scale. If the required length falls below the line, a bond of this capacity may be used. If neither a 2/0 nor a 4/0 bond is satisfactory, it will be necessary to parallel two bonds. Omission of the splice-bar conductivity from the nomograph also is valid for its use in selecting a rail bond, since the resistance at installation is not as important as the resistance after time is allowed for deterioration of the joint.

Here's a Way to Fix a Broken Strand Of Cutting-Machine Rope

A QUICK AND EFFECTIVE METHOD of putting a cutting-machine rope with a broken strand back into service has been devised by Delmar Blackburn, a Jeffrey 35-B operator at the Kopperstown No. 1 mine, Coal Div., Eastern Gas & Fuel Associates, Kopperstown, W. Va. *Coal Age* is indebted to M. H. Dinsmore, foreman on Mr. Blackburn's section, for passing the idea along.

As a section foreman, Mr. Dinsmore writes, he has observed that breaking of a single strand of a multiple-strand rope on this type of machine may be handled in several different ways. The strands may be taped but the effect is short lived since pulling over the sheeves cuts the tape. The ends may be unwound from the rope, an undesirable job with danger to the eyes or exposed skin from the loose ends as the rope is being unwound. In addition, the original contour of the rope is materially altered. It kinks more rapidly and is greatly weakened. While many other methods may be used, the effects are about the same.

A rope repaired by the method followed by Mr. Blackburn, however, can be used about the same length of service time as might have been expected from its condition before the break, Mr. Dinsmore reports. This is Mr. Blackburn's method:

1. Insert a pick (or similarly sharp object) through the remaining strands, dividing them as nearly equal as possible and close to the broken end of the strand.
2. Bring the end of the broken strand through the division made by the pick, with the end extending about 2 in.
3. Remove the pick and the wire rope, returning to its original shape, will hold the broken strand.
4. Follow the same procedure for the other end. After the rope has been pulled through the sheeves a few times, the ends of the broken strand disappear and a close examination is needed to see the repair.

THE NEW CATERPILLAR D8 TRACTOR

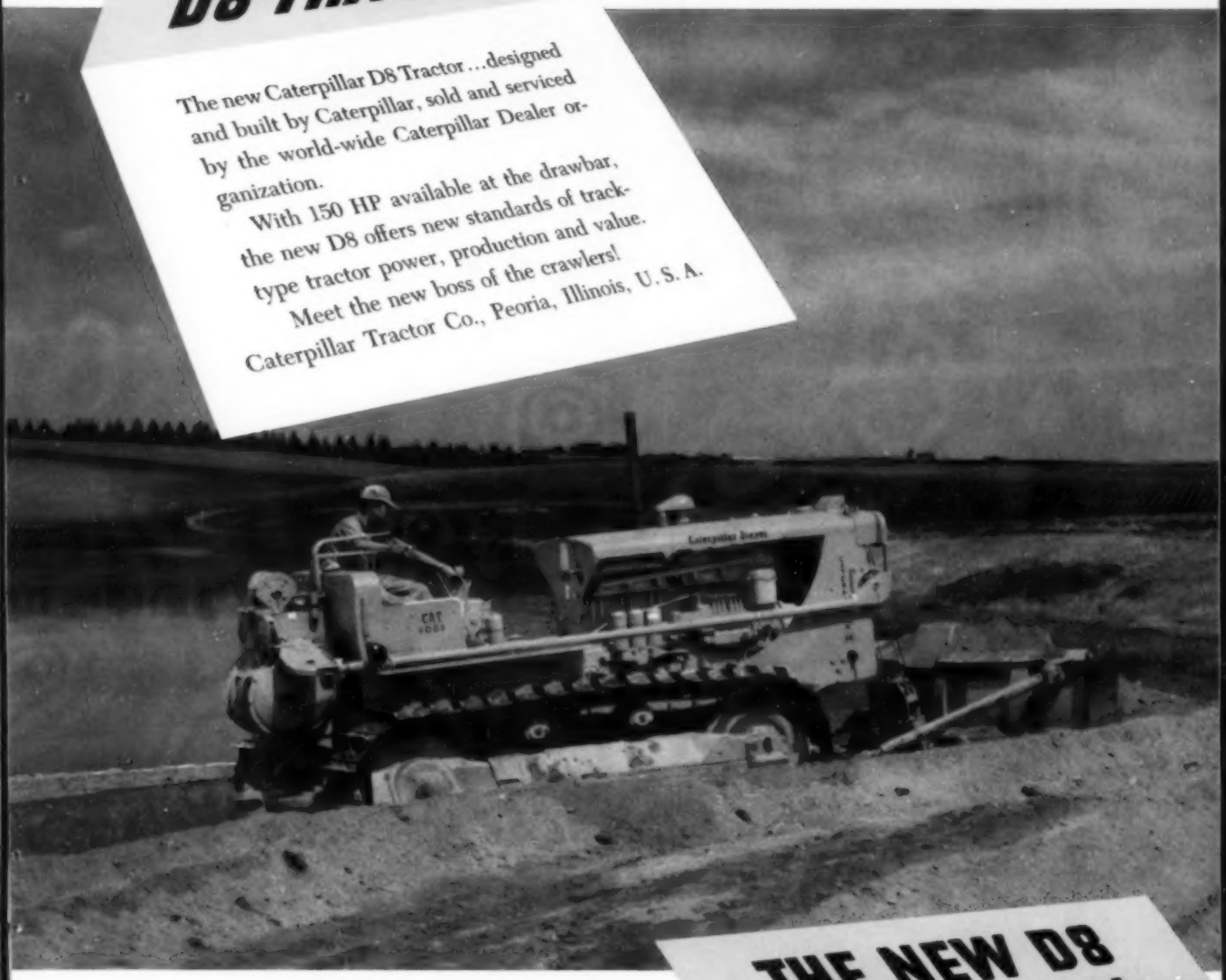
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The new Caterpillar D8 Tractor...designed and built by Caterpillar, sold and serviced by the world-wide Caterpillar Dealer organization.

With 150 HP available at the drawbar, the new D8 offers new standards of track-type tractor power, production and value.

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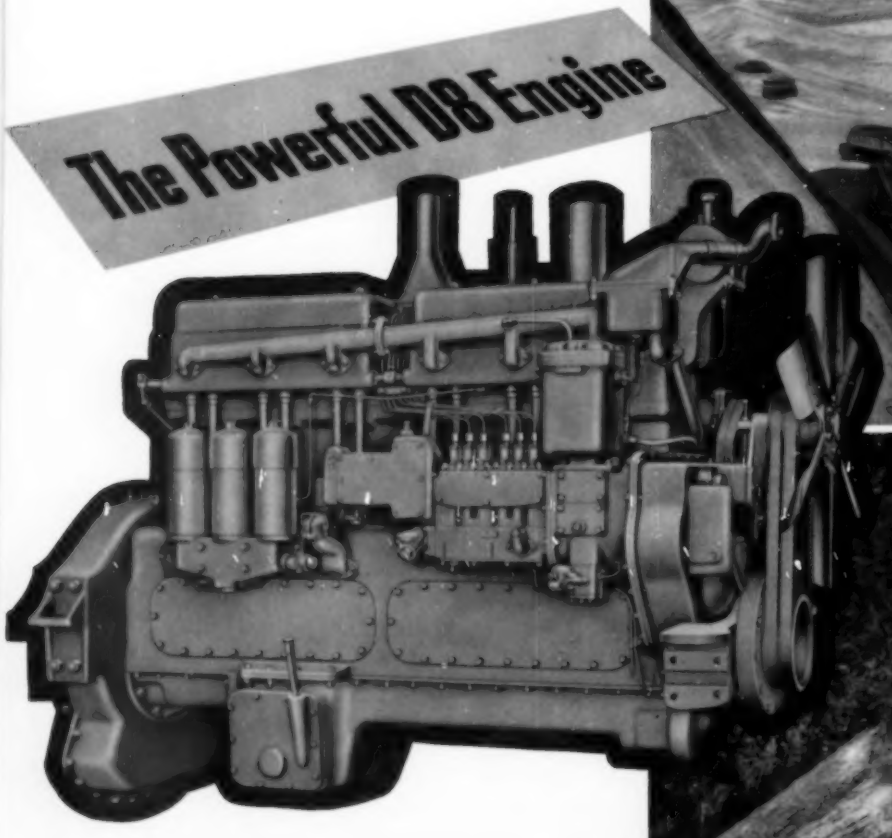
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150 Drawbar Horsepower Provided by Caterpillar D8 Engine

The new high performance of the Caterpillar D8 Tractor stems from the 185 HP, 1200 RPM diesel engine. Important new features, built into the time-tested and job-proved Caterpillar design, contribute to longer engine life and decreased operating costs as well as higher power. Some of these features are: new cylinder head incorporating valve rotators and hardened valve seat inserts, new camshaft, aluminum alloy pistons with stainless steel heat plug in the high temperature zone and a cast-in iron band for the top piston ring groove. A larger oil pump driven from the front of the crankshaft has an exclusive throttling valve pressure control which assures correct lubrication for all moving parts from the first turn of the crankshaft.

This powerful engine, with these and many other advanced features, is one of the big reasons why the D8 gives you more value than ever before.













The Oil Clutch

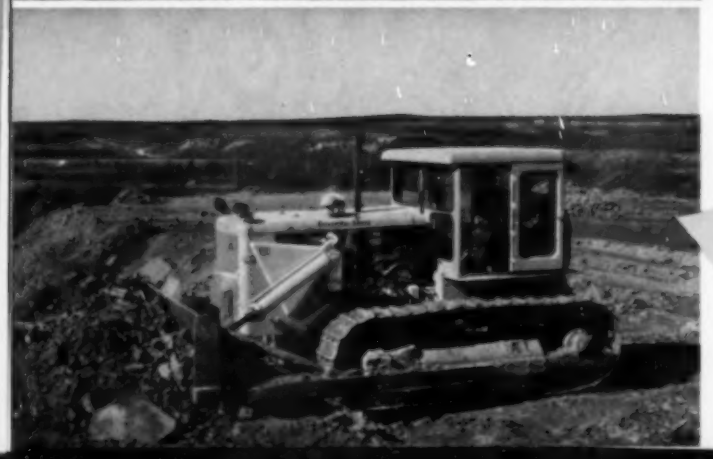
Exclusive with Caterpillar Profitable to You...

Only Caterpillar offers you the long life and low maintenance cost of the oil clutch. The outstanding feature of this advanced clutch is that oil films absorb the friction and heat. The metallic friction surfaces do not come into contact until the last revolution or two before engagement. The clutch has its own lubrication system with gear-type pump and suction screen. The pump supplies oil under pressure to the hydraulic booster, which makes the clutch exceptionally easy to operate. Oil is also delivered to the inner diameter of the three clutch plates. This continual lubrication and cooling is the principal reason for much longer periods between adjustment and replacement than is possible with the conventional dry clutch. The oil clutch is another big reason why the D8 is a better buy.



THE NEW D8 GIVES YOU...

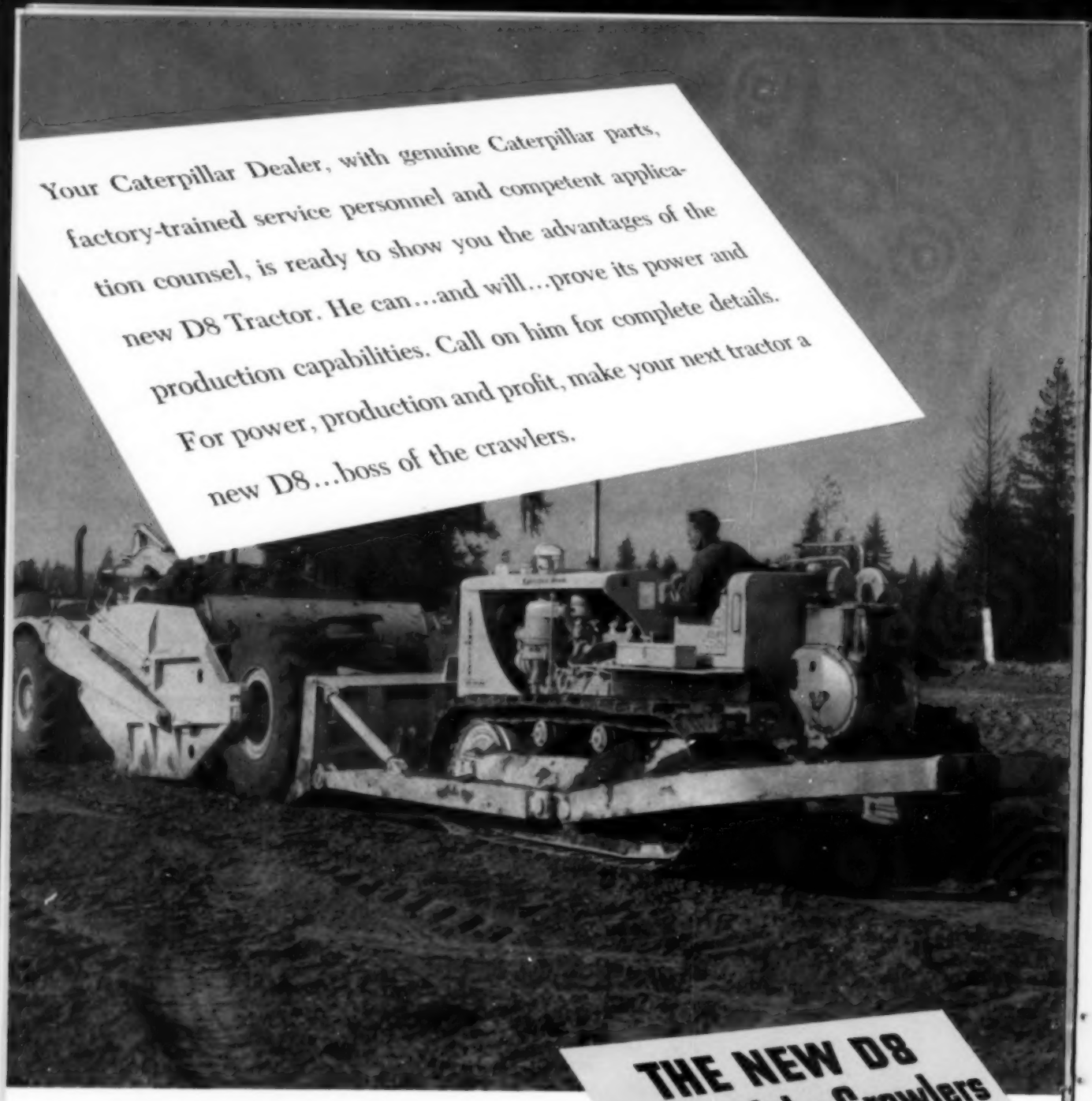
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THE NEW D8
Boss of the Crawlers

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The new Caterpillar D8 Tractor offers new highs in earthmoving production in push-tractor operations. The D8, equipped with No. 8S Bulldozer, heavy duty track roller guards, crankcase guard and tandem pusher frame, will cut your work cycles to a minimum.

Fast and maneuverable, the D8 applies a full 150 HP to the job of loading your hauling units in new record times. Push-loading, singly or in tandem, is provided to meet the conditions of your job.

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Lubrication is positive • the right lubricant is always used • uniform pressure assures that the right amount of lubricant is applied • there's less danger of accident to workers • portable unit can be taken into mine, or shop.

All this adds up to better lubrication at lower cost—and a great improvement in effective production time.

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Bit-Head Designs Prove Important Factor In Both Drilling Speeds and Tool Life

SLIGHT MODIFICATIONS in sintered tungsten-carbide roof-bit head designs can make a great difference in both the tool's performance and cost, according to recent extensive tests at Mather collieries, Pickands, Mather & Co., Mather, Pa.

The tests, observed by experienced representatives of the mine, bit and drill manufacturers, involved drilling with three carbide bits in a medium sandstone roof, two of which were Kennametal Styles HFD and FDH. The Fletcher DAA-7 roof drilling machine illustrated was used and was equipped with a flow-control valve for adjusting pressure and a regular throttle for adjusting revolutions per minute. Results with a very slight difference in design (HFD v FDH bits) varied by 35%, it was reported. A commonly accepted fact—that proper rotational speed and pressure are of major importance for securing best drilling results—was proved conclusively by the test.

Other conclusions from the operating test were:

1. Higher pressure gives the best results whenever bit-head design is such that fast penetration rates can be obtained.

2. Lower rotational speeds give better results than high speeds when used with the proper pressure.

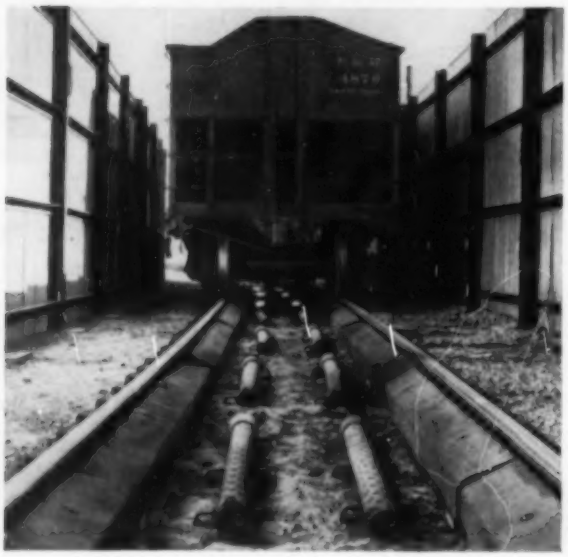
3. Faster bit wear, shorter bit life and higher drilling cost result from use of slow penetration rates when drilling hard abrasive materials like sandstone.

According to a report of test results, a maximum drilling speed of 22 inches per minute was obtained with the Style FDH bit operating at 1,200 psi and 78 rpm. Its drilling speed was reduced slightly when rotational speed was increased to 106 rpm. At 900 psi, the same bit drilled at a maximum speed of 19 in and 81 rpm. This gradually decreased to 16 inches per minute as drill speed was increased to 88 rpm. Only half the best drilling rate, or 11 inches per minute, was obtained by a reduction in pressure from 1,200 to 900 psi and a slight reduction from 78 to 71 rpm.

A Kennametal Style HFD bit (recommended by the maker for shale, slate and laminated-sandstone formations) also was tested at the same presure and rotational speed providing top performance with the FDH bit. It failed to penetrate, but drilled at a maximum rate of 15 inches per minute when rotational speed was increased from 78 to 100 rpm, and pressure was reduced from 1,200 to 700 psi. Chief disadvantage, however, of this combination of speeds and pressures was the very rapid bit wear, which was further proved by application of the Style FDH bit at the same rates. It operated at approximately the same speed of 15 inches per minute at 100 rpm and 700 psi but edge wear was found to be very rapid.

In the tests, holes 5 ft deep were drilled in roof material consisting of 10 in of slate and 51 in of white sandstone. Kennametal 7/8-in drill rods were used.

Wrought-Iron Heaters Thaw Rail Cars



A NEW CAR-THAWING INSTALLATION designed to thaw coal frozen in open hoppers in cold weather has been developed by the engineering department of the Norfolk & Western Ry. Co. The "pilot model," installed at the company's coal loading pier at Lamberts Point, Va., reportedly performed satisfactorily in speeding up unloading operations when tested for a brief 2-wk period last winter.

In construction of the unit, 24 lengths of 4-in wrought-iron pipe were cut into small pieces and installed near ground level between the rails. Prior to installation, holes were drilled in the top half of each pipe and a gas-fired jet inserted in one end. The compact heating units were then placed in double rows at the center of the road bed. When the device is operating, heat from the jet is projected upward through the perforated area and helps melt the ice formations that otherwise keeps coal frozen in the hopper and prevents prompt and efficient unloading operations.

Wrought iron was selected by N. & W. engineers for this application, it was reported, because of the material's proven performance in resisting corrosion and its ability to withstand heat at intense temperatures.



O-B Hanger Puncture Strength Increased 10,000 Volts . . .

ANOTHER MILESTONE in the 50 years of O-B Hanger leadership has been realized with the recent increase in the electrical breakdown strength of O-B Hangers using Dirigo insulation. Previously well above the standard 7,000-volt test requirements, the puncture strength of Dirigo insulation has now been increased by 10,000 volts.

INSULATION IMPROVEMENTS assure you even longer-lasting O-B Hanger wear on both negative and positive trolley lines.

MECHANICAL STRENGTH of Dirigo insulation increased 30 per cent, enabling O-B Hangers to take still heavier punishment.

HIGH RESISTANCE to fungus growth and chemical solvents also stepped up further, contributing to longer hanger life in all types of service.

Ohio Brass

MANSFIELD OHIO, U. S. A.

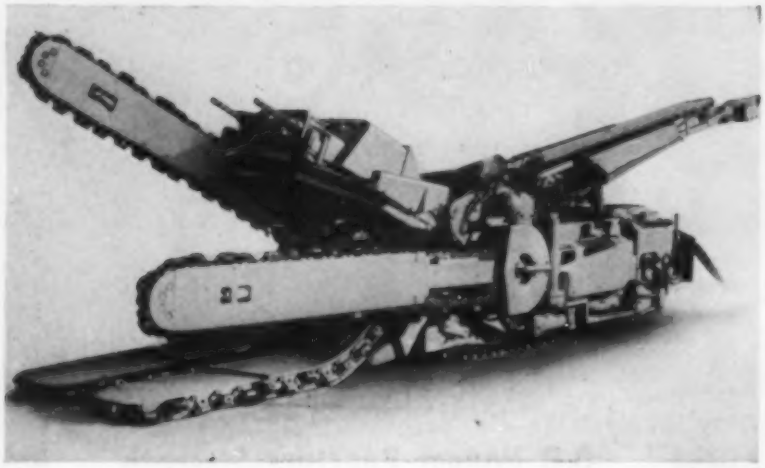
IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

Feeder and Trolley Materials • Control Materials • Trolley Shoes
Roof Bolt Shells and Plugs • Rail Bonds • Automatic Couplers

4499-M

Equipment News

Machinery Maker Acquires New Continuous Miner (1)

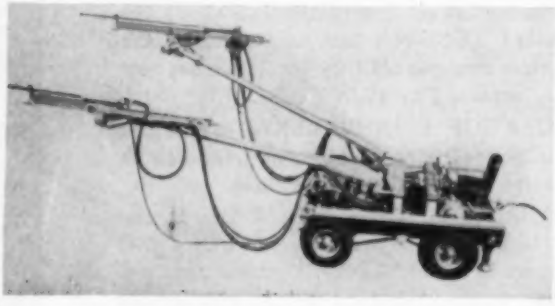


The Jeffrey Mfg. Co. announced last month that it had acquired all rights, title, and interest in and to patents from K. L. Konnerth, vice president-operations, United States Steel Corp., on a continuous-mining machine which, heretofore, has been engineered and manufactured by Jeffrey. The miner, known as the 34-F, supplements Jeffrey's present line of continuous-mining machines.

The 34-F unit has been in use for several years, and 73 of them are currently in operation or in the process of manufacture. The machines are operating in U. S. Steel mines and are mining coal at costs considerably below those of conventional production methods, Jeffrey reports.

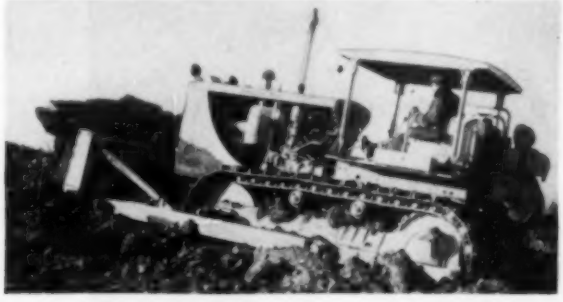
The 34-F miner embodies the principles of frontal attack utilizing a combination of digging and loading elements and vibrating hammers, the latter operating at a critical frequency to break down the coal. The entire unit is mounted on crawlers, with the hammers on a carriage adjustable to various seam heights. All elements are electrically powered, either through mechanical or hydraulic transmissions. The digging and loading portion, including hydraulic pumps for actuating all movements of the machine, is driven by one 70-hp continuously rated motor. A power truck, converting DC mine power to AC of a frequency lower than 60 cycles, is provided to operate the hammers.

Circle No. 1 appearing on the postage-free card facing p 212 for full details from the Jeffrey Mfg. Co., Columbus 16, Ohio.



One Man Operates Self-Propelled Remotely Controlled Jumbo Drill (2)

One man can move into position with the new self-propelled Gardner-Denver JSP "Mobiljumbo" and drill out a complete round in a face up to 25 ft wide without leaving his seat on the jumbo carriage, the maker reports. All positioning of the booms and drills, as well as the complete drilling cycle, is controlled by hydraulic controls conveniently grouped in front of the operator and the unit has been specially designed to reduce still further the time, effort and cost of rock drilling, Gardner-Denver engineers point out. The machine is lowered onto jacks for stability while drilling and the drills can be positioned for down or up holes, as well as for horizontal drilling, thus making it possible to equip the JSP for drilling roof-bolt holes. All positioning is hydraulically locked and free from creeping. Each set of side wheels is chain-driven by an air motor and the unit is steered by powering one set of wheels at a time. Various boom lengths are available for drilling faces up to 14 ft high. Full details by circling No. 2 on postage-free card from Gardner-Denver Co., Quincy, Ill.

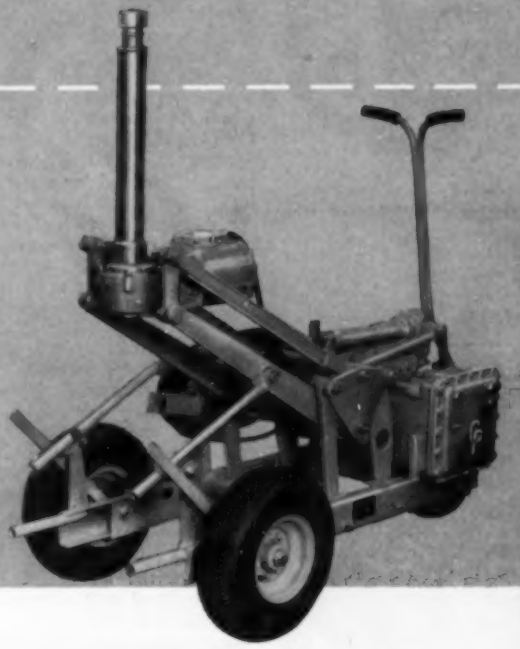


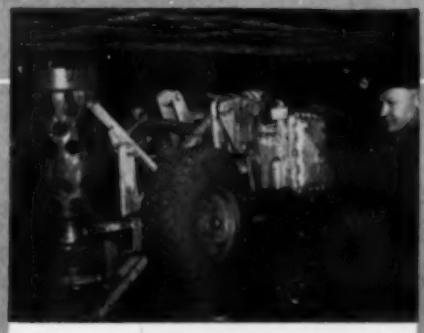
Crawler Tractor Offers More Power (3)

Marking its 50th year of manufacture of track-type tractors, Caterpillar Tractor Co. has announced a new 150-hp D8 unit that is said by the company to incorporate increased horsepower and weight advantages and various engineering advancements in engine design that contribute to increased production, lower operating costs and longer service life. A Caterpillar-built diesel engine with an output of 185 hp operating at a governed speed of 1,200 rpm powers the new D8 tractor. In first gear, the D8 develops a drawbar pull of 29,200 lb with the standard transmission, and 39,800 lb with the optional heavy-duty transmission. Speeds of the latest D8 are increased over earlier models and five forward and three reverse gears are provided, with speeds up to 5.8 mph in each with standard transmission. Another optional transmission permits speeds up to 7.2 mph. Full details from the Caterpillar Tractor Co., Peoria, Ill.

Raising the roof

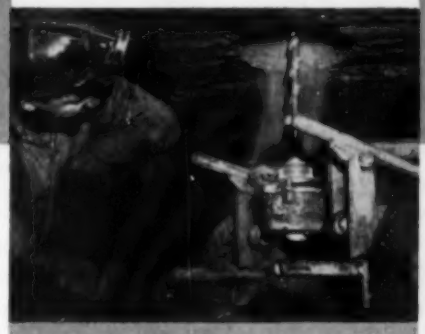
at Barnes and Tucker's Mine #20





Before drilling bolt hole the RBD-30 is equipped with a 9¼" hitch bit to drill away the bony.

Photo courtesy of Kennametal, Inc.



After the bony core is removed, the RBD-30 makes a quick change to a regular auger and drills a 42" bolt hole inside the hitch hole. And without repositioning, it quickly sets expansion bolt.

Photo courtesy of Kennametal, Inc.

CP's compact RBD-30 Mobile Roof Bolting Unit helped solve an unusual problem at Barnes and Tucker's Mine #20 and at the same time demonstrated its adaptability and ease of handling in close quarters.

In a 31" seam it was necessary to remove 20" of bony to assure better ventilation and provide more headroom. The "low slung," 28" height of the RBD-30 permissible Roof Bolting Unit was ideal for this close quarter work. Its complete maneuverability enabled it to drill through the bony with a 9¼" hitch bit then quickly drill a 42" bolt hole and set expansion bolt into solid roof.

The RBD-30 operates equally as well in high seams. One motor drives both auger and bolt-setter – a telescopic chuck permits 10 inch auger adjustment to conform to roof irregularities. Slip clutches prevent feed motor from stalling – protect drill and bolt setting motor.

Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.

Other Chicago Pneumatic Coal Mining Equipment

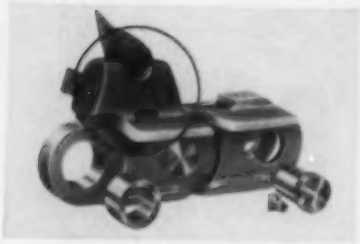
Self Propelled Tramdrills

Actuated Drill Arms
For mine car, truck and locomotive mounting

Hand Held and
Post Mounted Coal Drills

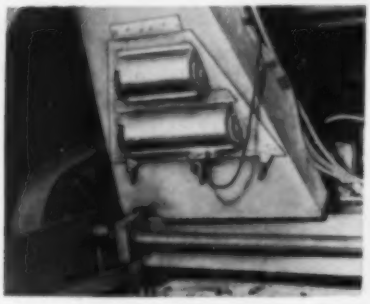
Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



DROP-FORGED PART ADDS STRENGTH TO CUTTER CHAIN (4)

Streamlined design has made drop-forging possible for the bit-carrying part of the Bowdil coal-cutter chain, formerly thought impossible to produce except by machining alloy steel castings, the company reports. Now all wearing parts of this chain are drop-forged and the bit-carrying body is securely welded to the links. Under development for some time, the accomplishment gives greater strength, longer chain life and better cutting performance, the maker says. Full details from the Bowdil Co., Canton 7, Ohio.

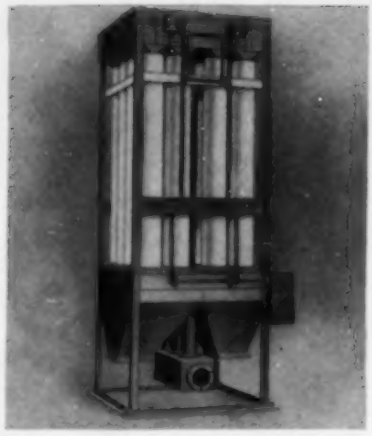


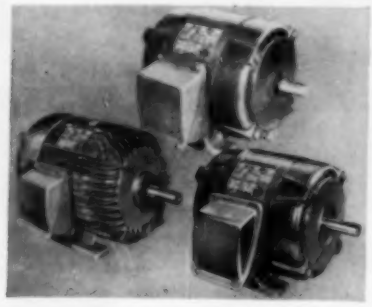
WARNING SYSTEM GUARDS PERMANENT MAGNETS (5)

New Eriez fully automatic "Magnalarm" system has been developed to eliminate human error in the maintenance of permanent magnetic separators, with savings of man-hours and production time, the maker says. Magnalarm utilizes a sensitive ferrometer that constantly measures the quantity of tramp iron accumulating on the magnet and at a predetermined quantity actuates an alarm, such as a light, bell or buzzer, etc., as desired. The alarm may be located at the magnet or remotely and offers a positive automatic indication that the separators need cleaning. It assures efficient operation of magnetic separators and removes the need for periodic inspection, the company points out. Full data from the Eriez Mfg. Co., Erie, Pa.

JET DUST COLLECTOR FEATURES REDUCED CLOTH AREA (6)

The newly developed "AMERjet" dust collector is a reverse-jet fabric unit designed for use where extremely fine particles are involved or the material must be collected in a dry state for reclaiming. The cleaning media is automatically reconditioned by a jet of high-pressure air forced through the cloth in an opposite direction and because the cleaning cycle is continuous, the AMERjet maintains a constant pressure drop and thus a steady volume of exhaust air, the maker says. The method also permits much higher velocities through the cleaning tubes, with less filter cloth needed and the size of the dust collectors materially reduced as a result, it is said. Bulletin 279 with full data from American Air Filter Co., Inc., Louisville 8, Ky.



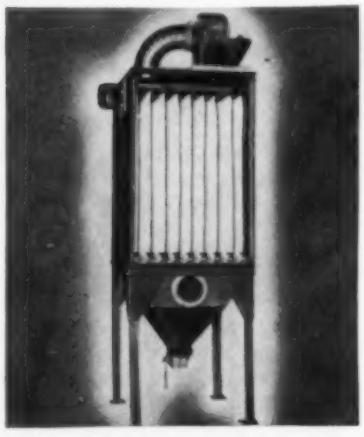


MOTOR LINE OFFERS MORE LIFE AND SMALLER SIZE (7)

The new Westinghouse induction motor—the Life Line A—has been designed to offer users longer motor life, greater flexibility in application and higher reliability, as well as decreased size. The Life Line A has improved ventilation, better insulation, a more efficient and better protected bearing and, in addition, is quieter and smaller per horsepower while conforming to the new NEMA standard dimensions, the company says. Wire, coil, dip and cable insulations are all new, and the Bondar wire insulation, for example, is a synthetic resin that has a service life of over three times that of other wire insulations now in use, it is reported. Ventilation improvements on the dripproof motor, it is said, make the motor suitable for both outdoor and indoor use and for all applications where a totally enclosed motor is not required. The units feature cast-iron frames and, in conforming to the new NEMA standards for 1- to 30-hp motors, provide space saving to users because they are smaller per horsepower. Full data from Westinghouse Electric Corp., Box 2099, Pittsburgh 30.

NEW CORING EQUIPMENT SPEEDS EXPLORATORY DRILLING (8)

Its introduction of "Wire Line Core Barrel" equipment for diamond core drilling provides a new tool and technique that promises to revolutionize exploratory drilling, according to the E. J. Longyear Co., Minneapolis 2, Minn. A number of BX-sized holes from 500 to 3,200 ft deep have been successfully completed and a hole is currently being drilled that is expected to reach 5,000 ft. Core recovered with the equipment is approximately 1$\frac{5}{16}$ in in diameter. While used for large holes in the petroleum industry for many years, the operating principle has never before been successfully applied to small-diameter diamond core drill holes, Longyear reports. As cited by the company, the significant features of the Wire Line Core Barrel, for which patents have been applied, are: (1) string of drill rods is hoisted from and lowered into the drill hole only when it is necessary to replace the diamond core bit; (2) at the end of each core run, the inner tube, together with the core-lifter assembly and the core, is extracted from the hole through the inside of the drill rods by a wire line cable reel, an operation that with skilled operators requires only 15 to 20 min for a 1,500-ft hole, including lowering of the empty inner tube, as compared to at least 60 min with conventional equipment; (3) the core barrel is equipped with a ball-bearing swivel-type head and an optional water shutoff valve, the latter a feature that eliminates the human element in detecting a core block since the valve prevents fluid circulation and alerts the operator that a block has occurred in the bit or inner tube. Full details offered by Longyear.



UNIT-TYPE DUST COLLECTOR FOR SMALLER VOLUMES (9)

New Pangborn Unit-Type CN cloth-bag dust collector is designed for economical and efficient collection of finely divided dusts in smaller-volume applications, and utilizes cloth filter bags in a manner similar to the large Pangborn Type CM dust collector. The new CN collector is self-contained and shipped assembled ready for installation. It is

B.F.Goodrich



Universal tires roll 125,000 miles under 40 tons of coal

THE Colonial Coal Company of Madisonville, Kentucky, hauls coal from the stripping pit to the mine tipple. Forty tons is the weight of the average load carried by the company's 20 trucks over rugged gravel and cobblestone roads. The trucks roll as many as 60 hours a week—and every one is equipped with B. F. Goodrich Universal tires.

Some of the Universal tires now in use have seen 125,000 miles of this severe service. Colonial reports Universal tires can be recapped as many as three times. One reason for such outstanding performance records is the Universal tread. It is specially compounded to resist snags and cuts. The husky, non-directional cleats resist skidding and slippage, pull through the roughest going faster and easier.

Under the tread is the patented B. F. Goodrich nylon shock shield. Layers of strong nylon cords stretch together under impact to protect the tire body from smashing road shocks. You save 4 ways because of this protection: (1) more original hours of service (2) more recappable tires and more hours of service per recap (3) increased bruise resistance (4) less danger of tread separation.

Join the growing list of mine operators who report longer service at lower cost with Universal tires. See your B. F. Goodrich retailer today. The address is listed under Tires in the Yellow Pages of your phone book. Or write *The B. F. Goodrich Company, Tire and Equipment Division, Akron 18, Ohio.*

Specify B. F. Goodrich tires when ordering new equipment



"UNIVERSAL TIRES are better than any other make of tire I know," says Everett Offit (above), driver for Colonial Coal Co. This company averages over 5,400 hours of service from BFG tires.



SHASTA COAL CORP., Bicknell, Ind., is another user of B. F. Goodrich tires. "We like the Universal tread over other treads," the company reports. "It holds the road better." (Center Rib Universal is shown at right.)



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3	8	13	18	23	28	33	38	43	48	53	58
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Company .....

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designed for indoor use and, the maker reports, the cleaned air frequently can be discharged inside the plant, offering a distinct saving where air is heated or cooled. Seven sizes of the CN collector are available, ranging from 200 to 1,000 sq ft of cloth area. Full data from the Pangborn Corp., Hagerstown, Md.



PORTABLE, RECORDING HOOKON VOLT-AMMETER (10)

A new portable recording instrument for obtaining a permanent record of AC current and voltages, the G-E Type CF-7 volt-ammeter, combines features of a self-latching multirange hookon current transformer and the simplicity of the Type CF inkless recorder in equipment suitable for indoor and outdoor applications, the maker reports. It is designed to be particularly useful for checking loads on distribution lines, verifying motor loads, and in detecting overload on circuits, transformers, motors and other AC apparatus. AC can be measured and recorded on both insulated and non-insulated conductors in circuits operating at potentials up to 8,700 v. Featuring a self-supporting hook suitable for all conductors up to 2 in in diameter, the transformer provides current ranges from 15 to 750 amp, selected by a range-changing switch on the side of the instrument. Full details from General Electric Co., Schenectady 5, N. Y.

FREE BULLETINS AVAILABLE

(33) LUBRICATING DRILLS AND COMPRESSORS—The Texas Co., New York 17, offers the latest edition of its technical manual entitled "Lubrication of Air Drills and Portable Compressors." The 36-p booklet provides a detailed discussion of the factors involved and the procedures for lubricating such units, maintenance and trouble shooting, together with tables and numerous lubrication cross-section drawings.

(34) TRANSFORMERS—Large distribution transformers (250-500 kva) designed to cope with increased load densities on distribution systems are discussed in Booklet B-6134 available from the Westinghouse Electric Corp., Box 2099, Pittsburgh 30. Constructional and standardization characteristics of the Type SL transformers are described and related to economic handling and operation procedures, with details of windings, method of tap changing outside the tank and accessories.

(35) SPAD GUN, spads and hangers offering faster, easier hanging of brattice cloth, water pipes, air hose and telephone lines are described in a bulletin available from the American Mine Supply Co., Pittsburgh 19.

(36) VIBRATING SCREENS—16-p catalog describing Universal's latest model high-speed vibrating screens, including screen-heating equipment, is offered by the Universal Vibrating Screen Co., Racine, Wis.

(37) CONTROL SELECTION GUIDE with the latest information on motor starters and push buttons is available from the General Electric Co., Schenectady 5, N. Y. The bulletin, designated as GEA-6061, provides buying information on AC magnetic motor starters (⅓ to 50 hp), AC combination starters (½ to 25 hp), push-button stations, AC manual motor starters and magnetic reversing controllers, with ratings, list prices, circuit diagrams and brief application data.

(38) UNDERGROUND AIR-OPERATED CORE DRILLS—Bulletin 340 issued by Sprague & Henwood, Inc., Scranton 2, Pa., covers two sizes of air-operated machines for either core drilling or blasthole drilling underground, along with complete working data, details of the air-actuated rod-pulling apparatus and a summary of the company's line of diamond bits and accessories.

(39) SHOVEL UNIT—Catalog K375 describing its improved 205 excavator with a 15-ton lift capacity and a ½-cu yd dipper capacity has been released by Koehring Co., Milwaukee 16, Wis. Covered in detail are the heavy-duty operating features of the 205, usable as a shovel, hoe, crane or dragline and available either crawler-mounted or on a truck body.

(40) EARTHMOVER—Model C Tournapull job stories from around the U. S. are assembled in a booklet available as Form TP-347 from the LeTourneau-Westinghouse Co., Peoria, Ill. It consists of reprints of job stories on Tournapull operations in various states, with accompanying informative data on haul length, load time and cycle time.

(41) FLEXIBLE COUPLINGS—New 20-p Catalog 1009 is available from the Lovejoy Flexible Coupling Co., Chicago 44. It provides detailed application data, specifications, dimensions and operating capacities for a wide range of flexible-coupling sizes and types.

(42) WIRE-ROPE SERVICE—17 "life-saving" tips for improving wire-rope service are given in a new Leschen folder entitled "How to Get More Work Out of Your Wire Rope." Suggestions for correct handling and storing and recommendations for proper use of rope are included. Single or several copies available from Leschen Wire Rope Div., H. K. Porter Co., Inc., St. Louis 12, Mo.

(43) EXCAVATOR MOVIE — Baldwin-Lima-Hamilton Corp., Construction Equipment Div., Lima, Ohio, has announced "The Big Lift," a new 29-min 16-mm color-sound movie that tells a dramatic story of the importance of the excavating-equipment industry in general and Lima shovels, cranes and draglines in particular. In compiling the on-the-job material, the producer traveled an estimated 18,000 mi in a 6-mo period, it is said. The movie is being distributed throughout the Lima distributor organization and a limited number of copies are available for loaning to clubs, associations and engineering and student groups.

(44) DUST COLLECTOR — Pangborn Corp., Hagerstown, Md., offers Bulletin 916 on its Unit-Type CN cloth-bag dust collector designed for all types of finely

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divided dry dusts in smaller volume applications at low equipment and installation costs and for operation indoors where clean air may be discharged inside the plant to save heating or cooling.

(45) DIESEL-MAINTENANCE MOVIE—A new strip film with sound, entitled "Servicing the Series '71' Cylinder" is available from distributors and dealers of the Detroit Diesel Engine Div., General Motors, Detroit 28. The film covers inspection procedures for determining the re-usability of cylinder parts during engine overhaul and step-by-step processing to restore them to factory-set standards, and is designed as an effective training aid for mechanics in the division's service outlets and for users maintaining their own repair facilities.

(46) CHAINS—12-p Catalog 1053 on its line of Kenkrome replacement chains, offered by the Kensington Steel Co., Chicago 28, provides full details on its bar chains, 700 and 800 pintle, miscellaneous pintle, rivetless, bar-link, detachable-link, drag and roller types. Also covered are renewable-tooth sprockets, crusher parts, dipper-tooth points and bases and crawler treads and idlers made from Supermang, Oroloy or Kenkrome.

(47) LIGHTWEIGHT PIPE — Naylor Pipe Co., Chicago 19, offers Bulletin 507 showing typical applications of its lightweight lockseam-spiralweld pipe and fittings. Included are standard specifications on 4- to 30-in pipe, and data on fabricated fittings, flanges and connections to meet all pipe-line requirements.

(48) SAFETY SHOES — Bulletin from Bone Dry Shoe Mfg. Co., Neosho, Mo., provides prices and details on its line of "Bone Dry" safety shoes, which are said by the maker to offer 18% more safety, about 20% longer service and more wearing comfort.

(49) SWITCHES — Booklet entitled "A Quick Break Interrupter Switch" describes the new Delta-Star Type QB device in various operating positions on different types of air switches, with full details of the nature and ratings of the arc interruptions. Available from the Delta-Star Electric Div., H. K. Porter Co., Inc., Chicago 12.

(50) SECONDARY CABLE — Bulletin RS-5 offered by the Rome Cable Corp., Rome, N. Y., contains specifications, physical data and sag and tension data on triplex service drop and secondary cable, both copper and aluminum conductors, and with either RoPrene (neoprene) or RoLene (polyethylene) insulation.

(51) HARDFACING ALLOYS—Amsco's complete line of hardfacing and build-up rods and electrodes are fully described in a new 48-p catalog. Full metallurgical and physical properties are included for the four automatic and 15 manual rods and electrodes. A technical section is provided to help select the correct hardfacing rod for unusual or hard-to-solve wear problems. Offered by American Manganese Steel Div., 389 E. 14th St., Chicago Heights, Ill.

(52) OILTIGHT PUSH BUTTONS, indicating lights, selector switches and accessories in the G-E line are described in a new 16-p Bulletin GEA-5779B available from the General Electric Co., Schenectady 5, N. Y. The booklet explains how these equipments operate and where they can be used and includes cross-sections, dimension and outline diagrams, and complete ordering information.

(53) MAINTENANCE-CONTROL SYSTEMS—Step-by-step procedures and 10 different order forms that can be adapted to varying company requirements as a simple means of planning, scheduling and controlling maintenance, are shown in bulletin offered by McCaskey Register Div., Victor Adding Machine Co., New York 1. Discussed are systems for maintenance requests or orders, supervisor's control, scheduling and job assignment, job costs, material and tool control.

(54) STOCKPILER — Bulletin A382 on the Athey Force-Feed HiLoader shows the HiLoader on a variety of applications and details performance and operating features, with actual job data. Copies from Caterpillar dealers or from Athey Products Corp., Chicago 38.

(55) STEEL CASTING MATERIAL SELECTION is simplified by a new "Circle L" slide chart developed by Lebanon Steel Foundry, Lebanon, Pa. Reference data on 19 carbon and low-alloy grades and 17 stainless and corrosion-resistant grades in regular production at the foundry are obtained by simply adjusting the guide arrow at the proper Lebanon grade under consideration.

(56) SWITCHGEAR—Delta-Star Electric Div., H. K. Porter Co., Inc., Chicago 12, offers a new folder titled "4 Steps to Better Products," covering Delta-Star's recently expanded departments. Each step of production of high-voltage electrical switchgear is covered, from engineering through designing, testing and manufacturing.

(57) VARIOUS PRODUCTS for maintenance, storage and materials handling in shops, offices, warehouses, etc., are shown, with prices, in new 32-p Catalog 1200-R available from Red Tiger Products, Inc., Chicago 6. Included are such items as steel shelving, bins, lockers and cabinets, small parts drawers and boxes, work benches, aluminum ladders, adjustable stools and chairs, hand, platform and lift trucks, paint-spray equipment, electric ovens, spotwelders, etc.

(58) TRAINING FOR WELDERS — Booklet describing its curriculum and organization is offered by The Hobart Trade School, Troy, Ohio. A non-profit organization recognized by various state and federal education authorities, the school offers courses in arc welding, carbon-arc welding, alloy steels and cast iron, inert-gas-shielded-arc welding, hardfacing, tool welding, stud welding, submerged arc welding, oxyacetylene welding and cutting and pipe welding.

(59) ELECTRIC VIBRATORS — Catalog 10, offered by the Cleveland Vibrator Co., Cleveland 13, provides full application data, with prices, on its new line of vibrators, the Models RC and MC, which are designed to handle any granular material, with almost noiseless operation and unusually heavy impact for their weight, the maker says.

(60) STEEL ELEVATOR BUCKETS in its line are described, with full data and prices, in 12-p Catalog 100 issued by the Standard Metal Mfg. Co., Malinta, Ohio.

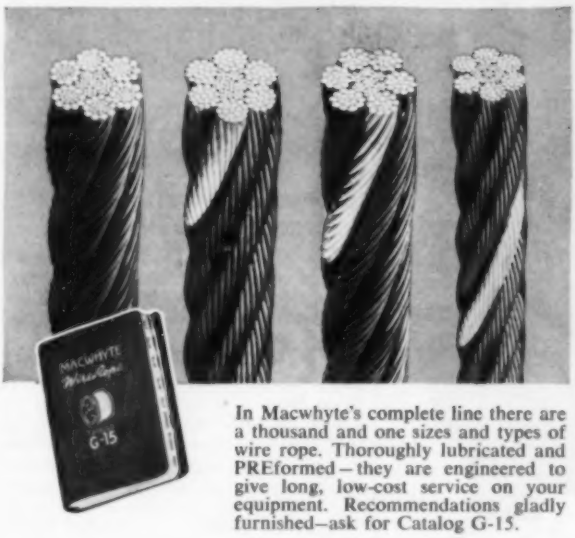
More Descriptions of New Equipment Appear on Pages 214-224

Use the postage-free card above as a check list in looking over this section (beginning on page 208) for equipment and free bulletins that interest you. Tear the card out now and as you go through, circle numbers of the items you want more data on. Then fill in and mail card.

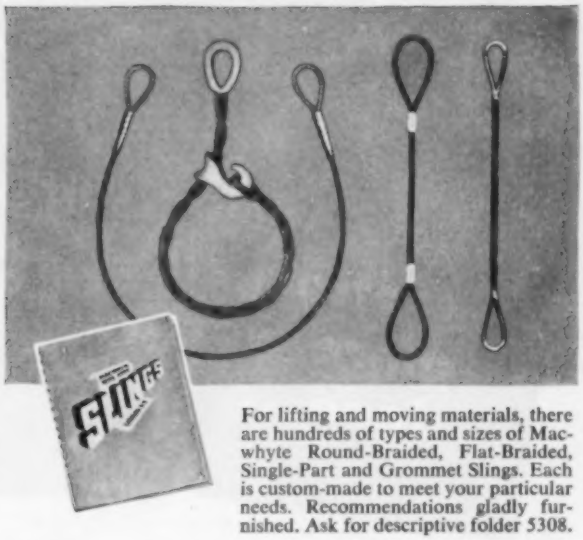
Get long, low-cost service with

MACWHYTE

WIRE ROPE • SLINGS • ASSEMBLIES



In Macwhyte's complete line there are a thousand and one sizes and types of wire rope. Thoroughly lubricated and PREformed – they are engineered to give long, low-cost service on your equipment. Recommendations gladly furnished–ask for Catalog G-15.



For lifting and moving materials, there are hundreds of types and sizes of Macwhyte Round-Braided, Flat-Braided, Single-Part and Grommet Slings. Each is custom-made to meet your particular needs. Recommendations gladly furnished. Ask for descriptive folder 5308.



Macwhyte Safe-Lock Wire Rope Assemblies are made to order in length, strength and flexibility desired. Terminals are permanently attached to one or both ends. Recommendations gladly furnished. Ask for Catalog 5201.

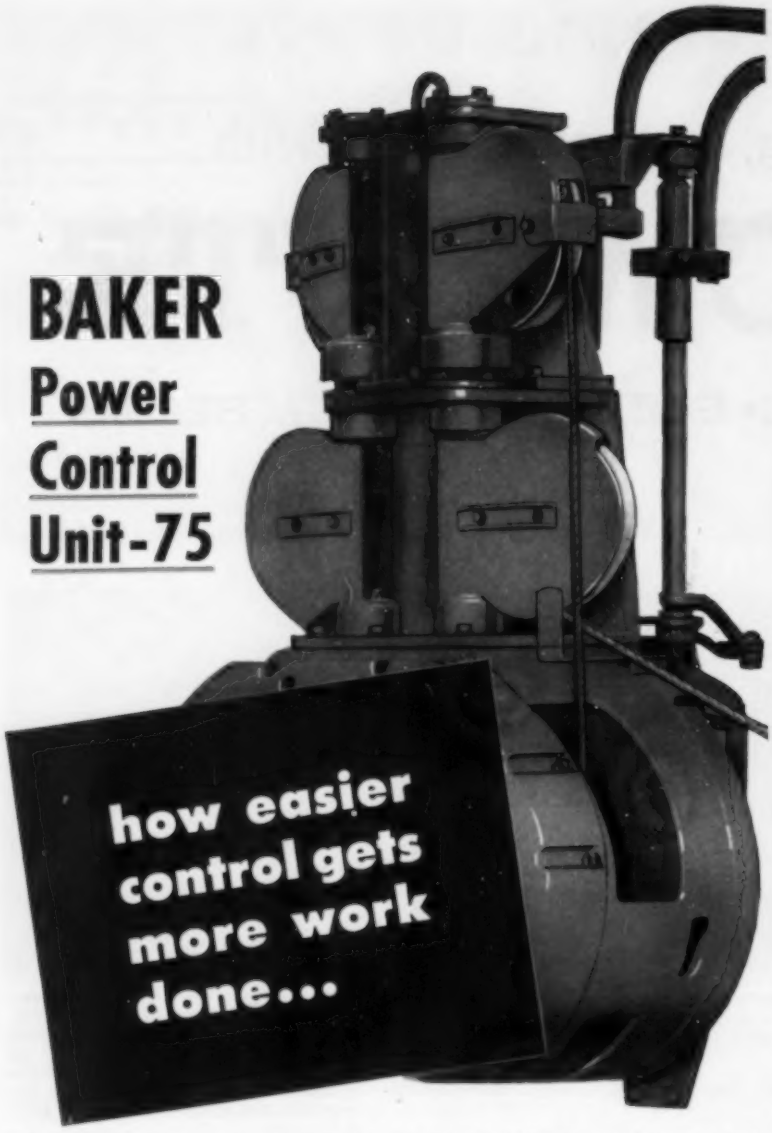


MACWHYTE COMPANY

2931 Fourteenth Avenue
Kenosha, Wisconsin

Manufacturers of Internally Lubricated PREformed Wire Rope–Round-Braided and Flat-Braided Wire Rope Slings–Stainless Steel Wire Rope–Monel Metal Wire Rope–Aircraft Cable and Swaged Fittings–Safe-Lock Wire Rope Assemblies.

Mill Depots: New York, Pittsburgh, Chicago, St. Paul, Fort Worth, Portland, Seattle, Los Angeles. Distributors throughout U.S.A.



Field tests *prove* it: every feature of the new Baker PCU-75 is designed for *easier* control that *boosts operator efficiency*. A new multiple disc clutch minimizes lever travel to *only 5"*. New 3-way hand levers—adjustable for length, angular position, height—respond to *lighter* pressure. New simplified brakes are *faster* on-and-off. Result is *easier, more accurate* control that gets *more work done. See* the new PCU-75—designed for your Allis-Chalmers HD-15, HD-20 or any tractor of comparable hp and speed—*at your Baker, Allis-Chalmers dealer!*



THE BAKER MANUFACTURING COMPANY • SPRINGFIELD, ILLINOIS

V-BELT OFFERS 40% MORE CAPACITY (11)

Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N. J., has introduced an improved "super-power" V-belt which, it says, has a horsepower capacity averaging 40% over standard V-belts. The new R/M Super-Power V-Belt also lasts relatively longer than standard V-belts, and narrower sheaves may be used on new drives, saving space, because fewer belts are required for the same power demands, the maker reports. The new belt also has practically no stretch, virtually eliminating belt-matching problems. Using a new super-strength synthetic fiber strength member for greater power, and made of all synthetic rubber, the belt is oilproof, non-spark and heat resistant. Folder 6628 available from company.



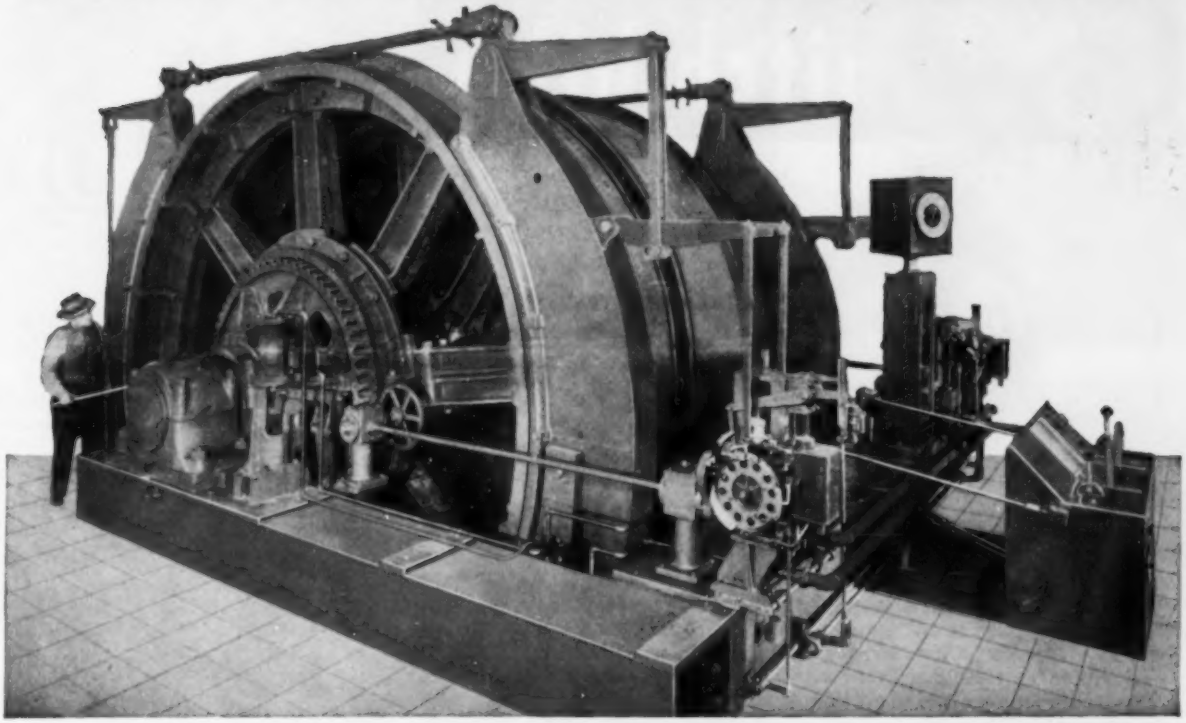
ENAMELED STEEL FOR ROOFING AND SIDING (12)

A new, improved enameled-steel roofing and siding material, called "V-Corr," is specially suited for industrial building construction and repair, according to the maker, the Toledo Porcelain Enamel Products Co., a subsidiary of the Bettinger Corp., Waltham, Mass. V-Corr is made from a corrugated steel base to which poreclain enamel has been fused at 1,550 F to offer complete protection against fire, corrosive gases, moisture, steam, smoke and salt air, the company says. Sold in sheet squares of 100 sq ft, V-Corr is available in a range of 18- to 24-gage steels, and can be easily applied to wood or steel frames in the conventional manner. All holes are drilled on the job with a portable high-speed drill to receive nails or bolts and for application to steel frames. A variety of corrosion-resistant fasteners are available to suit any particular design, location or condition, the company says. Full details from Toledo Porcelain.

HYDRAULIC JACK POWERED BY AIR MOTOR (13)

A new-type jack using 80 to 100 lb of compressed air to operate a separate hydraulic pump has been announced by the Duff-Norton Mfg. Co., Pittsburgh 30. The versatile combination jack-and-ram consists of a choice of four hydraulic rams which can move 30 tons in any direction a distance of 2, 3½, 6 and 20 in, respectively. The pump, portable buggy on which the air motor is mounted and accessories weigh only 150 lb. Among the outstanding features of the new jack cited by the maker, in addition to saving

ELECTRIC MINE HOISTS FROM VULCAN OF WILKES-BARRE



ARE DESIGNED AND BUILT TO MEET ANY SPECIFIED REQUIREMENTS

The Electric hoist shown above has "everything" to promote fast, safe, economical operation. Weighing approximately 420,000 lbs. it will be driven by two 1250 hp. A.C. motors through single-reduction herringbone gears which are completely enclosed in an oil-tight steel casing.

The two "Built-Up" all-steel drums, 18 ft. in diameter and 4 ft. 3 in. in width, will each carry approximately 2500 ft. of 1¾ in. rope in two layers. One drum is equipped with a positive toothed-type clutch, for balanced hoisting from any one of three levels in a shaft 2625 feet deep. Each drum is equipped with powerful post-type parallel-motion brakes operated by oil-hydraulic brake engines and controlled by modern safety devices which provide dependable protection against any damage that might otherwise be caused by current failure or by errors on the part of the operator. Brake and clutch on the loose drum are mechanically and electrically interlocked.

The main shaft and both of the two pinion shafts are mounted on self-aligning spherical roller bearings. Other modern features include gear-driven micrometer depth indicators, a trip recorder, a recording tachometer and centralized control at a steel desk.

All VULCAN hoists are engineered carefully and built accurately. Many different types and sizes, from 5 hp. up, are illustrated and described in Bulletin A-407. Write for a free copy and tell us about your hoisting requirements. Our engineers welcome opportunities to make helpful suggestions without charge or obligation.

Vulcan Iron Works

Established 1849

WILKES-BARRE, PA., U.S.A.

New York City Office, 50 Church Street

DESIGNERS AND BUILDERS OF ELECTRIC HOISTS, "ALLCASTSTEEL" SHEAVES, CAGES, SKIPS, GUNBOATS, ETC., UNDERGROUND CONVEYORS AND ALL TYPES OF LOCOMOTIVES FOR BOTH UNDERGROUND AND SURFACE HAULAGE



don't hitch hike



...ride a "JEEP"

The Lee-Norse TJ1 Mine Jeep gets you there safely! Here's the best answer for speedier underground transportation to and from working faces and emergency areas for mine superintendents, engineers, inspectors and maintenance personnel. A versatile performer the Lee-Norse Jeep can be used to pull man-trip cars, fire-fighting equipment and can be quickly placed in service as an ambulance. Detailed data available on request. Write now!



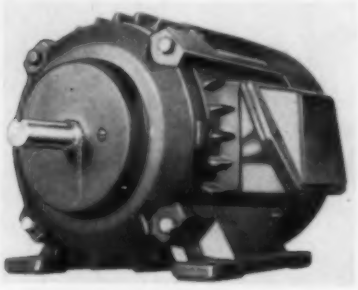
...ride a "SCOOTER"

No reason for mechanics, pumpers, fire bosses and other maintenance personnel to lose valuable time hitch-hiking when there is a Lee-Norse Scooter at hand. Weighing approximately 1000 lbs., the Scooter is popularly priced and its low-operating cost fits into every mine budget. The Scooter has a 48" wheelbase, is 9' in overall length and is available in all track gauges from 36" to 48". Where time is a factor the Lee-Norse Scooter is a "must". Send today for complete information and prices.

Lee-Norse Company
CHARLEROI, PA.



time and labor, is the safety feature which permits operator to stand at a distance in the event the ram should slip while under pressure. Details from Duff-Norton.

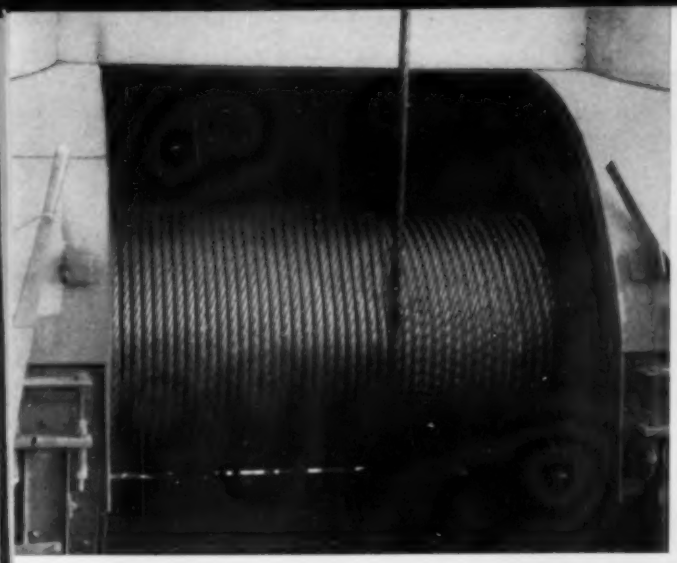


MORE POWER IN LESS SPACE FOR NEW MOTORS (14)

A new line of well protected, versatile squirrel-cage induction motors, including protected and enclosed motors for all industrial purposes, is being built to recently adopted NEMA standards by the Reliance Electric & Engineering Co., Cleveland 10. Research in new insulating materials, ventilation, heat transfer and more efficient electrical designs has made possible greater horsepower in more compact space and better protection of the motor windings, leads and bearings, the company reports. The first of the new Reliance motors to appear will be built for 1-, 1½- and 2-hp applications, with the balance of the line, up to and including 30 hp, to be introduced at regular intervals during the next year. The present Reliance AC line will continue to be available during the changeover period. Further data, including an informative "Compar-A-Frame Chart," available from Reliance.

OIL-ACTUATED TRUCK BRAKE CONTROLS HILL SPEED (15)

New "Torqmatic Brake" which provides positive control over the downhill speed of heavy-duty off-highway trucks without wear on the conventional friction brakes is an added package to the Allison Torqmatic converter now in general use with Allison Torqmatic transmissions. Utilizing oil that also absorbs heat generated in braking, the Torqmatic





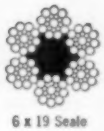




OVERCOMING ABRASION—Wire rope takes a beating on some jobs by abrasion. It is squeezed in multiple layers under tremendous pressure on rotary drilling drums in the Texas oil fields. In the Northwest it drags under heavy logs.

In this Arizona mine it is scraped over rocks to operate a slusher. Everywhere it is rubbed severely on winches that do not wind smooth. Under such conditions Red-Strand 6 x 19 Seale wire rope will last longer and save you money.

What can you do better with 6x19 Seale Red-Strand?



6 x 19 Seale



6 x 19 Filler Wire

6 x 19 Seale has the same strength and weight as the more frequently used 6 x 19 Filler Wire, but the arrangement and size of the wires is different. You can see in the diagrams that the outer wires are fewer in number and larger in size. They provide *high resistance to abrasion* and greater wearing quality with somewhat less flexibility.

It's the perfect rope for certain jobs. Would it solve a problem for you? Be less trouble? Save more money? A Leschen man is near you. Perhaps he can help. Leschen is providing *longer-than-expected* wire rope service to industry everywhere.

Send for the 64-page Leschen Wire Rope Handbook. It describes Seale and all other Red-Strand wire rope constructions.

LESCHEN WIRE ROPE DIVISION
The Watson-Stillman Company
(A SUBSIDIARY OF H. K. PORTER COMPANY, INC.)
St. Louis 12, Missouri

LESCHEN
HERCULES Red-Strand
WIRE ROPE

ELIMINATES SHOCKS and BURNS

PROTECTS YOUR EQUIPMENT

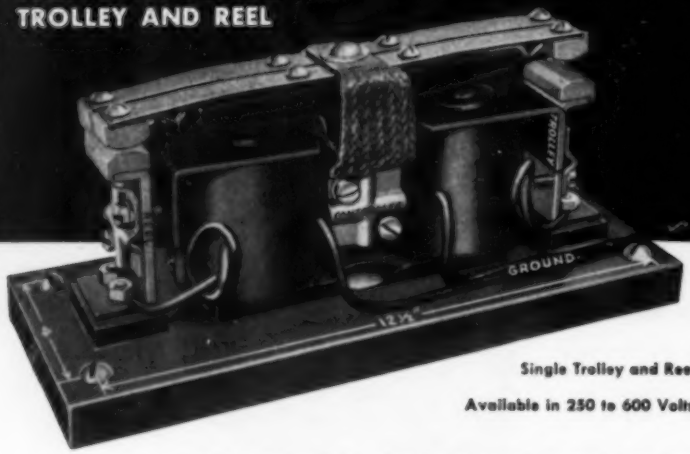
PROMOTES SAFETY

ENTIRELY AUTOMATIC

P-G AUTOMATIC

TRANSFER SWITCH

SINGLE OR DOUBLE TROLLEY AND REEL



Single Trolley and Reel

Available in 250 to 600 Volts

P-G Automatic Transfer Switches are designed for use on all types and makes of gathering locomotives.

Automatically transfers the current from trolley to reel, or vice-versa. Hand operated switches are eliminated.

Promotes safety—avoid shocks or burns to operator while changing from trolley to reel.

Simple in design, easy to install, requires very little space, and can be mounted anywhere. Furnished complete with cover.

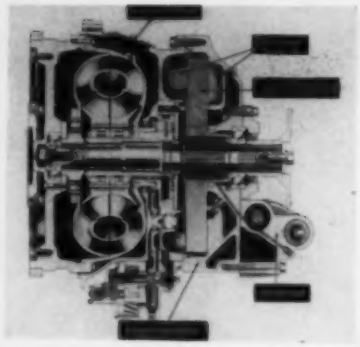
Heavy duty coils provide for positive contact through double contact assembly. Contacts easily renewable.

P-G

THE POST-GLOVER ELECTRIC COMPANY

•ESTABLISHED 1892•

221 WEST THIRD STREET, CINCINNATI 2, OHIO



Brake is not a friction-type brake and thus has no parts to burn up or wear out under heavy usage, the maker reports. Operated downhill under greater control and at higher speed, a truck so equipped can make more trips per shift, and maintenance and replacement of linings on the conventional brakes are greatly reduced, it is reported. The Torqmatic Brake can be specified on new trucks or field-installed on vehicles already equipped with Allison Torqmatic Drives. Full data from Allison Div., General Motors Corp., Indianapolis 6, Ind.

RAYON BELTS WEIGH LESS; BREAKER STRIP FOR IMPACT (16)

Conveyor belts made of rayon which are said to weigh less than conventional cotton duck belts but to be equally as strong now are being marketed by United States Rubber Co., New York 20. Rayon has proved to be more resistant to ripping or tearing than duck plies and is used in both the lengthwise and crosswise directions of the belt, in the crosswise direction making the belt more flexible and more troughable, which results in less spillage, the company points out. Since rayon weighs one-third less than cotton, yet is equally strong, there is a saving in power required to operate the belt. The rayon belts will be marketed under the trade names of U. S. Matchless and U. S. Giant.

A new "Nyton" breaker strip for conveyor belts which uses nylon combined with cotton to replace the conventional all-cotton breaker strip also has been developed by United States Rubber Co. Principal advantage of the nylon-cotton mixture is that it makes the belt more flexible in the length-wise direction, thus taking up the shock of impact during loading operations, the company says. More cotton has been added in the filler to increase resistance to gouging and tearing of the carrying surface cover. The Nyton breaker will be available in all U. S. heavy-duty conveyor belts, including the U. S. Giant and U. S. Matchless lines. Details from U.S. Rubber.

CONTINUOUS-MINER BIT (17)

A new undercutter bit with stop, the CCS-2, designed especially for continuous miners, has been announced by Carboloy Dept., General Electric Co., Detroit 32. The new bit can be used on all cutting machines that employ ½ x 1-in bits. The addition of a stop on the new bit, according to Carboloy,

HOW MUCH CAN Tuffy® DRAGLINE BOOST YOUR PROFITS?





Figure It Out—Tuffy Drags often give up to *twice* the service of other ropes used for draglines! How much in dollars and cents would you save by cutting your dragline replacement costs in half? The super strength and extra service life of Tuffy Dragline can make an important difference in your operating costs.

High Capacity Equipment, such as dragline buckets up to 40 cu. yd., give you greater stripping efficiency. But those big buckets call for a rope that can withstand tremendous stresses. Tuffy Draglines are designed with the extra stamina, abrasive resistance and flexibility needed to handle the big ones . . . move more material for a longer time. One user says, *"Previous average dragline service was 300 hours; now getting 700 hours with Tuffy Draglines."*

Try Tuffy Dragline on your strippers. Compare the service you get from Tuffy to the service you get from other draglines . . . and see how much more cents-a-ton profit Tuffy Dragline can make for you!

Tuffy Scraper Rope
Flexible enough to withstand sharp bends . . . stiff enough to resist looping and kinking when slack . . . tough to stand off drum crushing!



Tuffy Dozer Rope
Designed to take the punishment of small winch drums and small sheaves . . . the shock of blade manipulation under toughest going!



Tuffy Slings
9-part, machine braided wire fabric construction is extra flexible, extra strong!

Tuffy Slusher Rope
Rigid, non-collapsing to eliminate drum crushing . . . elastic and flexible to take shock loads!



union UNION WIRE ROPE CORP *Wire Rope* **corporation**

2130 Manchester Avenue, Kansas City 26, Mo.

Specialists In High Carbon Wire, Wire Rope and Braided Wire Fabric

CONTINUOUS MINING?

Want 6 hours or more actual loading time per shift?

LONG PIGGYBACK® CONVEYOR SYSTEM

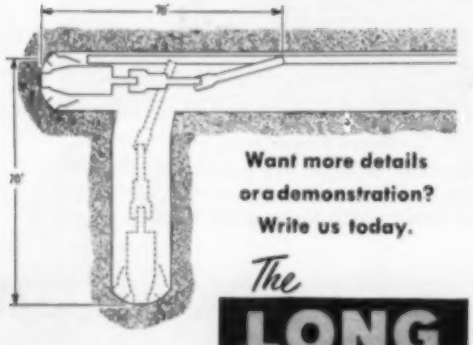


The Industry knows this to be a fact—by actual time studies, up to six hours actual loading time per shift is not unusual with the Long Piggyback* System—even when it is operated with mobile loaders in two or more rooms.

Now—this unique system offers the same advantages when used with any type continuous mining machine. The Long System utilizes practical, low-investment, low-maintenance chain conveyor equipment that has been proven in service. With the Piggyback System, enough potential advance can often be provided to allow operation of an entire shift without interruption.

* *Trade Mark*

The LONG Piggyback System for Continuous Mining



The Piggyback System can be applied to any present-day continuous miner, with or without the mobile self-loading conveyor (or loader). When the self-loading conveyor (or loader) is included, reaches extended to 70 feet from the room pan line in any direction and individual pan-ups of 60 feet become practical.

Want more details or a demonstration? Write us today.

The **LONG** *Company*

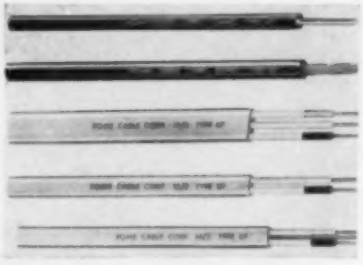
OAK HILL, W. VA.

Formerly Long Super Mine Car Co.

keeps it from slipping through the chain and into the sprocket of the machine when biting into tough coal formations.

V-BELT SHEAVES (18)

New Browning BP line of multiple-groove V-belt sheaves is available with two, three or four grooves, ranging from 7 to 18.4 in pitch diameter and designed with B groove and a bushing-bore range of ½ to 1¾ in. The units offer less weight and lower cost at no sacrifice in strength, quality, finish or design, the maker reports. The new sheave, like other Browning power-transmission products, is designed to take Browning's malleable split-taper compression bushing. Bulletin 1986 with full details and prices from Browning Mfg. Co., Maysville, Ky.

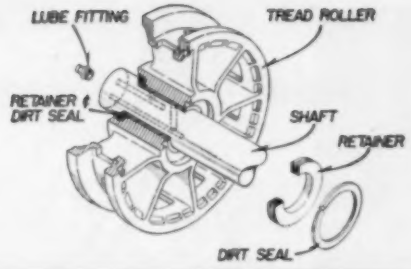


MULTI-PURPOSE CABLE (19)

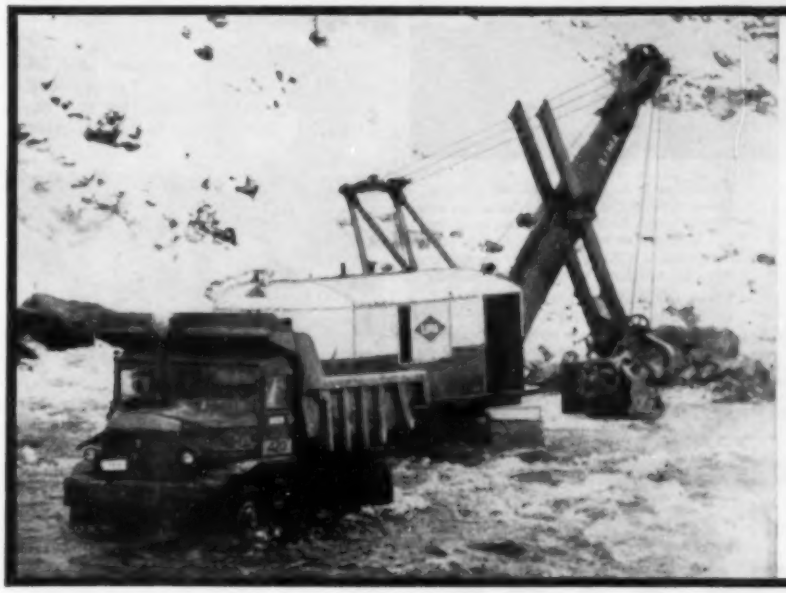
A new low-cost versatile cable for branch and feeder circuits announced by the Rome Cable Corp., Rome, N. Y., the Rome FlexAll is designed especially for underground feeder service and for locations where dampness or corrosive action are encountered, and is available in single-, two- and three-conductor construction. Featuring an insulation and sheath of Rome Synthinol thermoplastic compound, Rome FlexAll is suitable for branch or feeder circuits buried directly in earth when provided with suitable overcurrent protection, the maker says. In addition, multiple-conductor FlexAll also is suitable for interior wiring, either exposed or concealed, and in wet or corrosive locations, in hollow spaces of masonry block or tile walls, or embedded in plaster or shallow chase in masonry, when suitably protected, it is said. Single-conductor FlexAll is available in Sizes 14 through 4 AWG, and multiple-conductor cable in Sizes 14 through 10 AWG. Bulletin RF-1 with full data from Rome Cable.

ONE-MAN AIR DRILLS (20)

Two new lightweight one-man air-leg drills, incorporating its Series "8" rock drills, have been announced by Gardner-Denver Co., Quincy, Ill. Model FL48 carries a 2½-in bore drill and weighs only 79 lb with a 4-ft feed leg. Model FL58 carries a 2⅝-in bore drill, and weighs 87 lb with a 4-ft feed leg. Both are available with a 2-, 3-, 4- or 5-ft feed travel, and a detachable feed-leg extension, said to be exclusive with Gardner-Denver air-leg drills, provides extra length when needed. The units have been designed for convenient and easy handling, minimum maintenance, and drilling of high footage per shift without undue operator fatigue, the company reports. Only one air hose is required, as air is fed to the feed leg



LIMA DIRT SEALS CUT DOWN-TIME AND MAINTENANCE COSTS



This LIMA shovel, demonstrates the importance of LIMA'S dirt seals and grease retainers.

In such work, abrasive material which wears out the bushings and shafts of ordinary shovels is excluded. LIMA seals the lubricant in and dirt out, thereby reducing friction and prolonging the life of bushing, roller and shaft.

COMPARE! No other machine gives you as much as LIMA!

1. Bronze bushings in tread, idler and drive rollers are protected by piston-type dirt seal rings and retainers.
2. All gears, smaller parts and shafts which are subject to extra wear are flame or induction hardened for longer life.
3. Main machinery is placed well back of center of rotation to eliminate excess counterweight.
4. Anti-friction bearings, used at all important bearing points, reduce destructive friction, fuel consumption and lubrication requirements.
5. Big capacity drums and sheaves lengthen cable life by reducing the need for double wrapping and sharp bends in cable.
6. Full air controls on travel, hoist, swing and boom hoist, result in smoother, more precise operation, minimum maintenance and less operator fatigue.
7. Torque converter (optional) automatically adjusts speed to load requirements, minimizing shock loading, making performance smoother and faster.
8. Wherever you are, you can depend on skilled service and nearby warehouse stocks of parts to keep your LIMA on the job continuously.

COMPARE and you'll specify LIMA for shovels (¾ yd. to 6 yds.), cranes (to 110 tons) and draglines (variable).

LIMA
SHOVELS • CRANES
DRAGLINES • PULLSHOVELS

BALDWIN BLH LIMA-HAMILTON
Construction Equipment Division

BALDWIN-LIMA-HAMILTON CORPORATION
Construction Equipment Division
LIMA, OHIO, U.S.A.

SPECIFY

FLEXIPIPE® the quality ventilating tubing



Flexipipe is now available with Rope Seam Suspension *at no additional cost.* The newest, best, quickest suspension . . . eliminates special accessories and suspension wires . . . *all you need is a nail.* It equalizes strain on the tubing.

Flexipipe is efficient, serviceable, economical. Jute and heavy-duty grades available in a variety of lengths and diameters to meet your requirements.

Write for complete information and sample.

Bemis Bro. Bag Co.

408-O Pine St.;
St. Louis 2, Mo.

Proven

1 The rapidly growing list of Coal Mines using Barney Type Car Spotting is unquestionable Evidence of its Value for Increasing Production.

2 The Superiority of the STAMLER HYDRAULIC CAR SPOTTER is proved by its selection after rigid tests and the examination of Outstanding Performance Records wherever used.

3 May we submit this Proof to You?

PARIS . . .
KENTUCKY
SCHROEDER BROS.
EXCLUSIVE SALES AGENT,
PITTSBURGH, PA.

THE W. R. STAMLER CO.



through the swivel connection, and drill and feed controls are conveniently grouped in one location on the dri backhead. Details from Gardner-Denve



LIGHTER ALUMINUM ROOF (21)

To meet demand for a maintenance-free metal roofing of thinner gage, Aluminum Co. of America, Pittsburgh 19, has added to its line a new lightweight corrugated aluminum sheet only 0.024 in thick. Made of the same durable high-strength alloy as the standard 0.024 in sheet, the new roofing and siding material may be used where narrow spans in the roof structure do not require the high beam strength of the 0.032-in sheet and offers the added advantage of low cost. Painting is not required and the sheet can be used with substantial economies for both new construction and re-roofing jobs and is also well adapted for use as an inner sheet and for both sides of an insulated wall, the maker reports. Full details from the company.

NEW DRILL STEEL (22)

A new alloy hollow drill steel with a wider range of hardening temperatures has been developed by the Crucible Steel Co. of America to meet specifications written by the metallurgical department of Ingersoll-Rand Co. The new steel is more foolproof in heat treatment, is easier to forge, requires only a simple annealing procedure for good machinability, and a proper degree of hardness is easily attained, the company reports. The steel is made to I-R Specification 551 and is available from Crucible Steel or from Ingersoll-Rand Co., New York 4.

For draining off corrosive mine waters

REPUBLIC PLASTIC PIPE



Republic Plastic Pipe is made by Pipe Men



CHEMICAL RESISTANCE OF FLEXIBLE PLASTIC PIPE

	At Room Temp.	At 140° F.		At Room Temp.	At 140° F.
Acetic Acid—10%	A	A	Methyl Bromide	A	A
Acetic Acid—100%	B	X	Milk	A	
Acetone	B	X	Mineral Oil	B	X
Ammonia—880 S.G.	A	A	Nitric Acid—10%	A	A
Ammonium Carbonate	A	A	Nitric Acid—95%	B	X
Beer	A		Phosphoric Acid—30%	A	A
Benzene	X	X	Phosphoric Acid—90%	A	X
Bromine (Vapors or Liquid)	X	X	Photographic Developer	A	A
Calcium Hydroxide	A	A	Potassium Carbonate	A	A
Carbonic Acid	A	A	Potassium Chloride (Saturated)	A	A
Carbon Tetrachloride	X	X	Potassium Dichromate—40%	A	A
Caustic Potash—50%	A	A	Silver Nitrate—10%	A	A
Caustic Soda up to 50%	A	A	Sodium Carbonate (Saturated)	A	A
Caustic Soda 50% and over	A	A	Sodium Chloride (Saturated)	A	A
Chlorine—100%	X	X	Sodium Sulphate	A	A
Citric Acid (Cold Saturated)	A	A	Sulphuric Acid—10%	A	A
Copper Sulphate	A	A	Sulphuric Acid—70%	A	B
Di-ethylene Glycol	A	B	Sulphurous Acid	A	A
Ethylene Dichloride	X	X	Tannic Acid	A	
Gasoline	X	X	Tanning Extracts	A	A
Glycerol—30%	A	A	Trichlorethylene	X	X
Formaldehyde	A		Vegetable and Animal Oils	X	X
Formic Acid—100%	A	A	Vinegar	A	A
Hydrobromic Acid—50%	A	A	Whiskey	X	
Hydrochloric Acid—Over 35%	A	A	Wine	X	
Hydrofluoric Acid—75%	A	A	Zinc Chloride	A	A
Hydrogen Peroxide—90%	A	X	Zinc Sulphate	A	A

A—Satisfactory B—Slightly Attacked X—Unsatisfactory

Mine waters can play havoc with pipe. They eat into it, make frequent replacement necessary.

Republic's New Flexible Plastic Pipe, made of polyethylene, resists this type of corrosion. It not only handles the corrosive liquids and gases which are a part of mine operations, but resists electrolytic corrosion as well.

Because it is lightweight and flexible, this new Plastic Pipe can be easily laid and moved from one point to another. It is made up with easily applied plastic insert-type fittings and stainless steel clamps. Fittings are available in a wide range of sizes and types that permit any type of piping arrangement, whether plastic-to-plastic or plastic-to-steel. Assembly is quick and easy.

Republic has proof of the advantages of Flexible Plastic Pipe right in its own mines. For complete data on sizes, fittings and applications of Republic Flexible Plastic Pipe, write to:

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Export Department: Chrysler Building, New York 17, N.Y.

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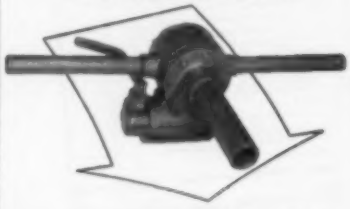
Other Republic Products include Casing—Tubing—Line Pipe—Bolts, Studs, Nuts and Rivets—Heat Exchanger Tubes—Steel Buildings

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EXPRESS 1-1571

Equipment Shorts You'll Want to Check

(23) WIDE PUSHER PLATE is one of the new accessories announced by the Frank G. Hough Co. Libertyville, Ill., to increase the usefulness of its Model HM "Payloader" 1½-yd tractor-shovel. Made of heavy rolled steel for rear-mounting, the pusher plate also includes a retractable towing link. The company also now offers a set of hydraulic connections and valves for installation on the Model HM where it is to be used as a prime mover to haul scrapers, wagons, etc.

(24) PULLEYS CAN BE LAGGED quickly in place without removing the pulley with "Neolag," a new sheet material that offers the full wearing and traction characteristics of neoprene, according to the maker. Used with it is a special liquid neoprene bonding agent said to securely bond the cured Neolag sheet to the pulley surface without rivets. Folder with details of the Neolag method offered by Main Products Corp., Philadelphia 47.

(25) FOR CUTTING WIRE ROPE and steel cable, two new shear-type tools have been developed by H. K. Porter Inc., Somerville, Mass., with a design that is said to minimize crushing or deforming either coarse or fine stranded cable in the rapid cutting action. The No. 1 TN cutter cuts all cable through ⅜ in, the No. 3 TN cutter through ⅝-in cable. Details from the maker.

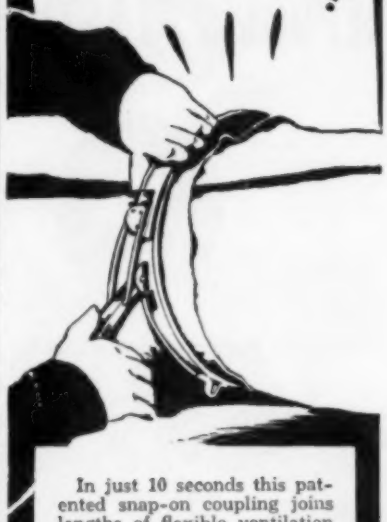
(26) FOR STORING SMALL PARTS, restyled "Jiffy" cabinets have a solid metal frame and back with styrene drawers, 5¾ x 2⅞ x 1¼, that divide into two or three compartments. Cabinets sit on rubber feet or may be hung from wall and come in four sizes, with 16, 24, 32 or 48 clear see-through drawers, and a choice of red or gray frame. Data from Fidelity Products Co., Canton 8, Ohio.

(27) COPPER-PLATED GEARS—Brad Foote Gear Works, Inc., Cicero 50, Ill., now is copper-plating all gears before shipment. In addition to preventing corrosion before the gears are put in service and completely eliminating the need for greasing, another feature of the method is the quick and smooth run-in of copper-plated gears because of gentle lapping action of the thin copper film, the company points out. New Bulletin 1988 gives full details.

(28) MAGNESIUM LADDERS – New magnesium safety platform step ladder has been designed to provide a broad working platform 2 ft from the top that is ribbed and fluted to prevent skidding, thereby permitting the user to stand without tiring for long periods of time. The lightweight ladders range from 4 to 10 ft in height, the 6-ft unit weighing only 12 lb for example. Details from Abbeon Supply Co., Jamaica 32, N. Y.

(29) SOLVENTS—A completely new line of safety solvents has been developed by the Nocon Products Corp., New York 5, to replace carbon-tetrachloride. Bulletin from company gives full details.

Makes tubing installation a SNAP!



In just 10 seconds this patented snap-on coupling joins lengths of flexible ventilation tubing. And, only Mine-Vent Tubing has it! Faster coupling and easy hanging of Mine-Vent means fresh air always *where and when you need it* . . . at the face, immediately after blasting . . . a constant supply of fresh air to keep working energies at peak capacity. For new ventilation efficiency — lower production costs — write your needs to **AMERICAN BRATTICE CLOTH CORP., 200 Buffalo St., Warsaw, Indiana**

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Some of the many outstanding features

The long-life grids now contain corrosion-resistant SILVIUM. New polyethylene insulating bar seals bottom of tubes and retains active material—thus maintaining high battery capacity for a longer working life. Improved negative plates. New sealing compound. Seamless shock-proof jar. New unbreakable plastic vent plugs.

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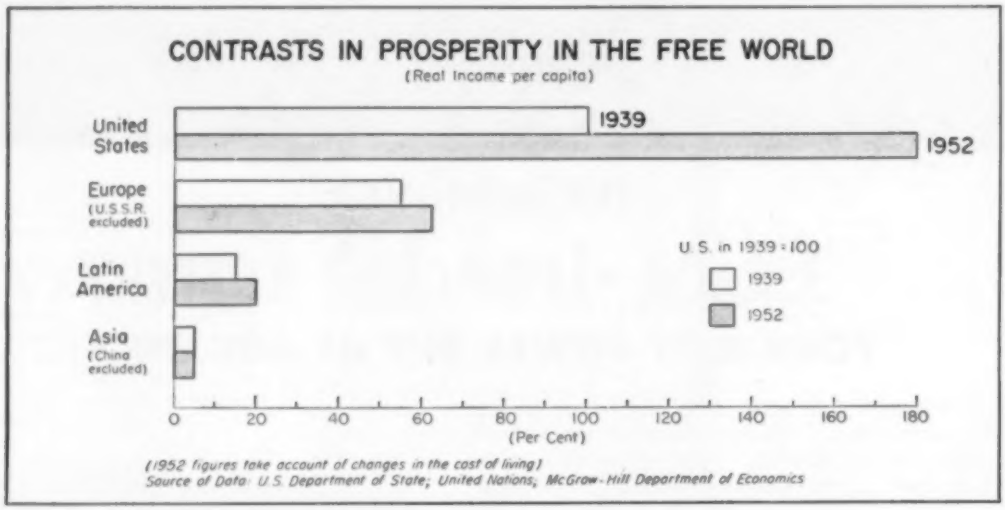
Contrasts in Prosperity Endanger the Free World

The chart in the middle of this page summarizes a situation of profound importance to every American. It shows that:

1. On the average, Americans are vastly better off economically than most other people in the free world, and
2. In recent years the gap in income between the average American and the average European, Latin American or Asian has greatly widened.

A Mounting Contrast

Even greater is the contrast between the real incomes of Asians and Americans. Today most Asians are no better off economically than they were back in 1939. On the other hand, the real income of the average American has almost doubled. As a result, the real income of the average Asian—always small by our standards—is now only a tiny fraction of that of Americans.



The chart shows that, at the outbreak of World War II, the real income (that is, actual purchasing power of income) of the average American was substantially higher than the average European's and much higher than the average Latin American's or Asian's. Since then, the European and Latin American have become better off. But the improvement in the economic lot of the average American has been so great that the others have been left far, far behind.

It must be remembered that the figures used to construct the chart are of varying quality. The fact is that few of the poorer countries have reliable statistics. However, it is generally agreed among competent observers, that the figures here presented offer a correct impression of the wide disparity in the average of real incomes between various parts of the free world. The figures, of course, have nothing decisive to say about spiritual and cultural values. In these, coun-

tries with relatively little material prosperity may be rich.

It is possible to draw a variety of morals from the story of lagging growth of income in other parts of the world. For one thing, it reflects the dynamic force of private enterprise. Private enterprise is characteristic of our economy far more than it is of most of the other free economies. The chart also reflects the fact that we are bountifully blessed with the natural resources essential to a high level of real income. Moreover, we did not suffer from the devastation and waste of two world wars as did many of the other free nations.

Narrowing the Gap

But perhaps the most important message which the chart conveys is one of warning. It warns that something must be done to narrow the gap in prosperity between America and other parts of the free world, if that world is to be united successfully in the struggle against totalitarian Communism. Writing in the HARVARD BUSINESS REVIEW, Kenneth E. Boulding recently put it this way:

> *"The crux of the problem is how to raise the three-quarters of the world that live on a low level to the high level of the other quarter, for it is precisely this wide disparity that makes our world so unstable. American-Russian relations, for instance [are] . . . complicated almost unbearably by the fact that each power is competing for the support of the vast fringe of underdeveloped countries . . . These countries are dissatisfied with their present state and are hovering between the two cultures, wondering which offers them the best chance of shifting from their present low-level to a high-level economy."*

Very real danger threatens from any feeling which may develop in the less fortunate free nations that our enviable economic progress has been made at their expense. Instead of viewing the American economic system as a model that might be followed by their own countries, they may be led to see in it a menace to their well-being. If Communist propaganda can persuade these people that their alliance with the free world will only result in their dropping farther and farther behind an increasingly prosperous United States, they will be driven to the side of totalitarianism.

Test of Effective Leadership

How can these free nations on the lower half of the income ladder be helped to alleviate the conditions that keep them there? Surely this question poses a whole series of complicated problems. Yet, if we do not exercise some effective leadership toward their solution, we can be sure that Russia will take advantage of the situation. In these circumstances, it is essential to both the stability and security of the free world that we help our less prosperous neighbors make satisfactory headway.

This does *not* mean that the United States should sacrifice its own economic progress in favor of some sort of global leveling scheme. On the contrary, a continually expanding and stronger economy is essential if we are to provide any real aid to our friends. Also, it goes without saying that our friends must be disposed to do all they can to improve their own economic position, if our cooperation to that end is to be effective.

Great Skill Required

Our part in a program to achieve this goal calls for a high degree of skill and statecraft. It involves international trade policy, which, in itself, presents a perplexing range of problems. It involves also programs of foreign technical and economic assistance. And expanded foreign investment must play a key role in a balanced program to strengthen the economies of the free world for our common good.

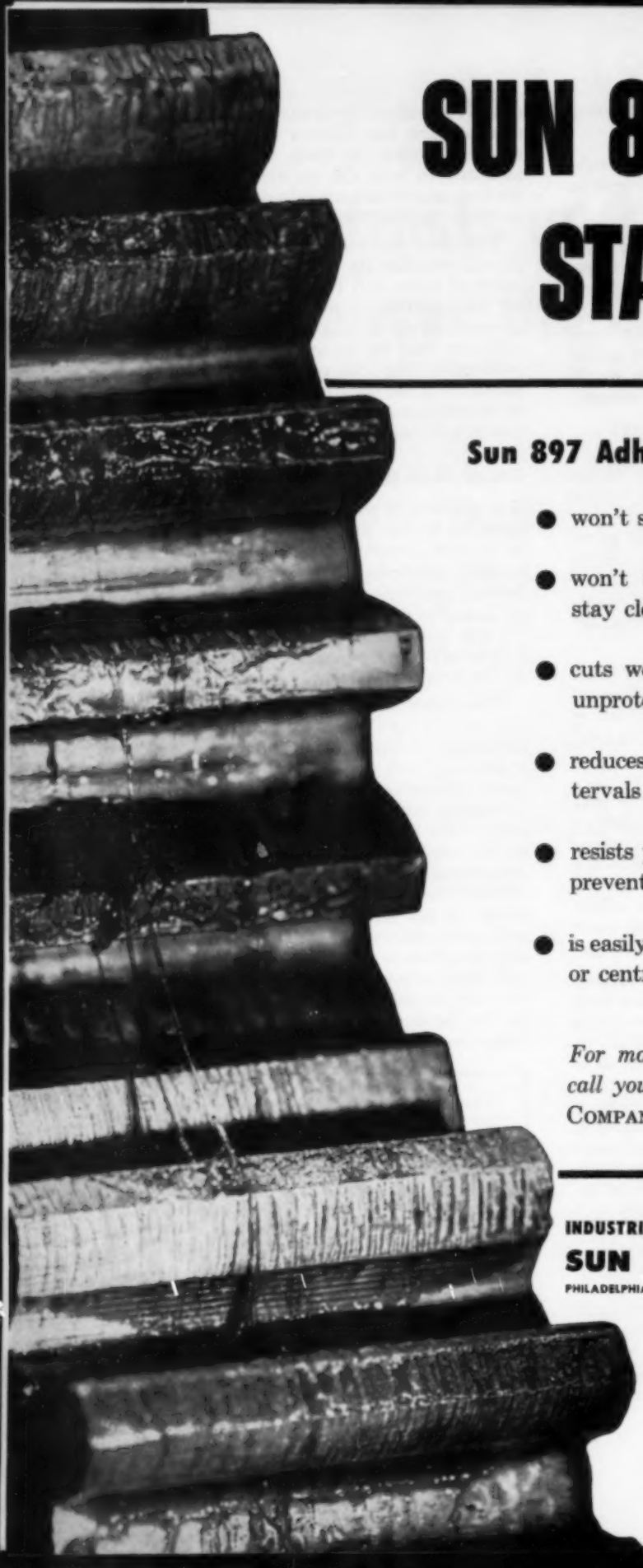
The Commission on Foreign Economic Policy, headed by Clarence Randall, has recently submitted a report, embodying the results of a monumental inquiry into our foreign economic relations and measures to improve them. From the very nature of the subject, discussion of the report is bound to be attended by much controversy and conflict. However, an awareness of the facts presented by this chart should inspire us to accord to the problems posed by the Randall Commission the careful and sober consideration they must have if any real progress is to be made in raising the general standards of human well-being throughout the free world. Our willingness and ability to do this have now become the real test of our statesmanship, both at home and abroad.

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News Round-Up

How the Top 15 Coal-Producing Groups Ranked in 1953

Group or Company	1953 Tonnage	% Change, 1952 to 1953	1952 Tonnage	% Change, 1951 to 1952	Standing 1953	1952	1951	1941
Pittsburgh Consolidation*	27,209,616	+5.9	25,700,730	−8.0	1	1	1	..†
U. S. Steel*	26,048,037	+35.4	19,241,478	−11.1	2	2	2	1
Peabody Coal*	9,929,158	+7.2	9,258,362	−23.0	3	4	4	3
Bethlehem Steel*	9,780,915	+27.0	7,698,617	−12.5	4	9	7	8
Eastern Gas & Fuel	9,483,431	−14.2	11,050,059	−9.2	5	3	3	2
Island Creek—Pond Creek*	8,879,428	+3.0	9,024,048	−19.2	6	6	5	5
Sinclair Coal and Southern Coal Groups*	8,761,838	−1.3	8,879,936	−0.5	7	5	6	29
Pittston Group*‡	8,557,140	+6.4	8,040,621	+9.7	8	7	9	..
Truax-Traer*	7,937,672	−0.5	7,976,155	−7.4	9	8	8	17
Republic Steel*	6,447,598	+33.7	4,822,518	−18.2	10	16	12	13
Pocahontas Fuel*	5,937,270	−3.5	6,155,607	+4.8	11	10	13	10
Jones & Laughlin Steel*	5,457,351	+20.4	4,343,798	−22.3	12	18	16	14
Berwind-White	5,288,223	−11.1	5,994,762	−0.5	13	12	10	9
North American Group	4,459,762	−9.1	4,907,416	−15.3	14	14	17	37
Rochester & Pittsburgh	4,448,286	−7.0	4,780,386	−17.0	15	17	14	11
Total	148,625,725	+7.8	137,874,463					

*Per cent change, 1952–53, was better than national average, which was 3.6% loss. †Before merger. ‡Includes W. L. Pursglove Coal Co., acquired in 1953.

Industry Leaders Boost 1953 Output

PRODUCTION OF THE TOP 15 operating organizations in the industry in 1953 totaled 148,625,725 tons, against 140,004,817 for the 15 ranking groups in 1952. No anthracite producer appeared in the first 15 in 1953. These figures and others, revealed in the table above, recently were released by J. R. Forsythe, general manager, *Keystone Coal Buyers' Manual*, a *Coal Age* affiliate.

Collectively, the 15 leaders in 1953 showed a gain of 7.8%, compared to a loss of 3.6% for the bituminous industry as a whole. Ten of these 15 companies produced more in 1953 than in 1952. All together, the leading 15 produced 33% of the 1953 estimated bituminous tonnage.

Three producers who were not in the top 15 in 1952, but had been on the list in earlier years, showed up again in 1953. These were Republic Steel, Jones & Laughlin Steel and Rochester & Pittsburgh. The four steel corporations together—U. S. Steel, Bethlehem, Republic and J. & L.—showed an increase of 9,627,491 tons, or 26.6%. The 11 leading commercial companies collectively showed a decrease of less than 1%.

Pittsburgh Consolidation held its place as the industry's leading producer, increasing its share of the total bituminous output from 5.4% in 1952 to 6.0% in 1953.

TVA Use of Coal Rising Sharply

The Tennessee Valley Authority burned 6,500,000 tons of coal in 1953, will purchase 11,000,000 tons in 1954 and in 1956 will require from 18,000,000 to 20,000,000 tons. The rising coal burn will be for additional units for five large steam plants now under construction, all of which are scheduled for completion in 1956. To provide additional power for the needs of the region, TVA is relying on steam plants and is planning practically no hydroelectric construction.

Since 1950, when TVA began large-scale coal buying for its steam plants, the agency has contracted for almost 50,000,000 tons at a cost of about $200,000,000, some $50,000,000 of which will go for transportation, mostly by rail. Officials estimate their coal contracts will provide work for 10,000 miners for more than a year on a 5-day week basis.

In 1953, mines in western Kentucky were the agency's principal suppliers, providing more than 3,000,000 tons. Tennessee mines were second, with 2,400,000 tons, followed by southern Illinois mines, with 900,000 tons. Small quantities were shipped from Alabama, eastern Kentucky and Indiana.

Anthracite Musters Region's Strength

Nearly 200 top figures in industry, labor and government, meeting Feb. 8 at Hazleton, Pa., sought ways to muster all resources in the region in an effort to restore anthracite to its former economic level. Thomas Kennedy, vice president, UMWA, proposed an eight-point program of action. Pennsylvania Secretary of Mines W. J. Clements urged a committee to ask President Eisenhower for $15,- to $20,000,000 for expansion of the state's mine-sealing program. Victor

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C. Diehm, president, Northeast Pennsylvania Industrial Development Commission, named a five-man committee to "go after some well-chosen objectives." And G. B. Fillmore, president, The Hudson Coal Co., asked for local laws that would make it difficult for residents of the region to install oil burners.

Mr. Kennedy's eight-point proposal was: (1) federal subsidy or storage of anthracite; (2) quota limitation on imported residual oil; (3) installation of central pumping stations pending construction of the proposed 170-mi drainage tunnel; (4) gasification of anthracite; (5) construction of government plants in the region; (6) government assistance for established industries; (7) government provision of ships to export anthracite; and (8) greater support, by use of anthracite, from friends, neighbors and industries in the region.

News Briefs and Trends

Fight Foreign Oil and Gas

Foreign Oil Policy Committee is arranging a series of conferences in selected cities east of the Mississippi in a fresh drive to recruit local support in the fight against rising imports of residual fuel oil from South America and elsewhere. Aim will be to encourage congressional action to stem the tide. Meanwhile, 50 representatives of management and labor in the coal and railroad industries, mostly from the Great Lakes area, met in mid-February at Minneapolis, Minn., to plan support of the Hunt bill (S. 1287), which would amend the Natural Gas Act by providing Federal Power Commission with a set of standards for granting or denying applications to import natural gas from Canada or Mexico.

Shaft Operators Spur Safety

Shaft-mine operators in Indiana, meeting at Terre Haute Feb. 6, laid plans to improve their state's safety record by launching a new program aimed at 100% training in accident prevention. Attending the meeting were representatives of all major shaft producing companies, state and federal agencies, National Coal Association and the UMWA. International and district UMWA officials pledged their cooperation in the drive. A USBM instructor has been assigned on a fulltime basis to conduct the training and a joint committee has been named to direct all phases of the campaign.

Pittsburgh Coal Steps Up Safety Training for All Mines

Pittsburgh Coal Co. Jan. 21 launched an all-out safety training program for all company mines and three affiliates in western Pennsylvania. Over 5,000 men are employed at the 15 or more operations, where combined classes for mineworkers and supervisors will be set up. Industry, state and federal agencies and the UMWA will cooperate in the program.



Coal Men Active in Engineering Group

THREE OF these mining men were installed as officers of the Mingo Chapter of the West Virginia Society of Professional Engineers at a dinner held in Williamson, W. Va., Jan. 22. Seated: Geo. W. Timberman (left), chief engineer, Pond Creek Colliery, N.&W. Mining Dept.; Wilbert T. Malenka, assistant chief engineer, Eastern Coal Corp., and chapter vice president; Theodore E. Chadwick, mining engineer, Ford Motor Co., chapter president; and David M. Gilliam, electrical engineer, West Virginia Engineering Co., and secretary-treasurer of the chapter. Standing: D. F. Crickmer (left), general superintendent, Pond Creek Colliery; Foster L. Apple, resident engineer, Ford Motor Co.; W. R. Ferrell, assistant maintenance superintendent, and R. D. Herron, maintenance superintendent, Rockhouse Div., Island Creek Coal Co.; M. W. Gilliam, vice president and district manager, West Virginia Engineering Co.; and Dave Ward, mining engineer, Sycamore Coal Co.

UMWA Hit With $1,000,000 Suit

Meadow Creek Coal Co., Monterey, Tenn., has entered suit against the UMWA for $1,000,000. The company is asking the Federal District Court to award $500,000 compensatory and $500,000 punitive damages as a result of labor troubles in 1948. The complaint alleges that UMWA agents and members invaded the company's property, urged company employees to strike, and provoked employees of the Tennessee Central Ry. to engage in a secondary boycott against the mine following the company's refusal to do business with the union in 1948. Earlier, in 1944, the company's employees had voted not to affiliate with UMWA.

Hanna Coal Starts New Mine

The Hanna Coal Co., Div. of Pittsburgh Consolidation Coal Co., is currently sinking a slope into its reserves of Pittsburgh No. 8 coal near Harrisville, Harrison County, Ohio, according to a recent announcement by James Hyslop, president. To be known as the Glen Castle mine, the new property is being designed for a capacity of 5,000 tpd and is expected to begin actual production about May. It will be located on the Adena branch of the Nickel Plate R.R. and the coal will be washed at the company's Georgetown preparation plant. Since the haulage road for the company's Dun Glen mine, operating in the same block of coal, has reached the practical economic limit, it expects to abandon the Dun Glen mine as soon as the new Glen Castle mine develops sufficient output, the company reports. Clyde Gibson is general superintendent of the Glen Castle mine.

R. & P. Plant Damaged

Two men died of injuries and six others were hospitalized as a result of an explosion Feb. 9 in the Lucerne preparation plant of the Rochester & Pittsburgh Coal Co., Lucernemines, Pa. While the exact cause was not immediately determinable, preliminary investigation uncovered the possibility that the blast may have been set off by a fire inside an 850-ft pipe through which dust is blown into an abandoned mine. One state inspector reported that the damage was concentrated around the pipe opening on the top of the 90-ft structure but emphasized that the exact cause of the explosion could not be definitely set until the investigation was completed. The blast and the accompanying fire, which burned for almost 3 hr, resulted in $500,000 damage to the plant, a preliminary estimate by company officials indicated.

Reveal Uranium Deposits

Exploratory mining soon will be undertaken to find whether it will be economically feasible to mine uranium on a commercial basis near Mauch Chunk, Pa., in the anthracite region, according to Robert V. White, president, Lehigh Coal



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& Navigation Co. Test borings made last year established the presence of uranium and the company at that time contracted to sell the uranium that might be mined to the Atomic Energy Commission.

Coal Companies Reveal Earnings

The Hudson Coal Co. reports net loss of $2,949,527 in 1953 against a deficit of $745,855 in 1952. Gross income in the year just closed totaled $28,946,595 compared with $38,214,978 in 1952.

Lehigh Coal & Navigation Co. reports net income in 1953 of $467,487, or 21c per share, against $2,001,325 and 91c in 1952.

Philadelphia & Reading Coal & Iron Co. reports net sales of $57,133,582, net income of $100,367 and per-share earnings of 7c for 1953, compared with $67,695,743, $2,836,162 and $2.01, respectively, for 1952.

Ayrshire Collieries Corp. reports sales of $18,349,371, net income of $638,425 and per-share earnings of $1.12 in the 6 mo ended Dec. 31, 1953, against $19,826,321, $1,277,562 and $2.25, respectively, for the same period in 1952.

Island Creek Coal Co. reports estimated net profit of $1,435,000, or $1.08 per share, for the year 1953, compared with $2,992,169, or $2.39 per share, for 1952.

Pond Creek Pocahontas Co. reports estimated net income of $1,450,000, or $4.27 per share, for 1953, compared with $1,820,857, or $5.36 per share, for 1952.

Truax-Traer Coal Co. reports net sales of $39,502,054, net income of $2,007,653, or $1.58 per common share, for the 9 mo ending Jan. 31, 1954, against $40,298,467, $2,003,093, and $1.56 a share, respectively for the same period ending a year earlier.

Scan Atomic Energy Uses

Oscar L. Chapman, former Secretary of the Interior, will survey the position of Pennsylvania Coal & Coke Co. relative to development of peacetime uses for atomic energy. Mr. Chapman became a director of the company after leaving government service. L. D. Silberstein, president and chairman of the company, said that Mr. Chapman will "determine areas where we can effectively and profitably participate in the atomic energy program as part of our diversification plan." P. C. & C. already has interests in coal, oil, natural gas, electric power, foundries, machinery manufacturing and shipping.

Sell New Packaged Stokers

Eddy Stoker Corp., Chicago, and Stokermatic Co., Salt Lake City, have joined to market an entirely new line of "packaged" coal-burning equipment for homes, according to an announcement Feb. 2. The Eddy firm will be exclusive distributor east of the Mississippi. The new units, manufactured by Stokermatic, are expected match oil and gas in price, performance, convenience and economy.



COAL MEN ON THE JOB . . .

THE VOCATIONAL TRAINING & Education Committee, National Coal Association, paid a visit Jan. 15-16 to the University of Alabama, Tuscaloosa (Coal Age, February, p 184). Here are some of the coal men and the university men who took part in discussions:

STANDING—A. J. Blair (left), consulting geologist, Birmingham; R. D. Watt, Republic Steel Corp.; Prof. Herbert Kuenzel; B. H. McCracken, Republic Steel Corp.; J. G. Hanlin, Alabama chief of safety and inspection; H. J. Hager, Alabama By-Products Corp.; and J. W. Hager, Woodward Iron Co.

SEATED (clockwise, starting at left end of table)—Dr. M. Edmund Speare, NCA; Dean J. R. Cudworth, University of Alabama; H. C. Walter, Lorain Coal & Dock Co.; F. R. Zachar, Christopher Coal Co.; Prof. R. G. Shotts; H. C. Woods, Sahara Coal Co.; Prof. J. W. Stewart; M. D. Cooper, NCA; Prof. A. C. Dorenfeld; E. B. Nelson, Tennessee Coal & Iron Div., U. S. Steel Corp.; R. W. Beamer, Rochester & Pittsburgh Coal Co.; and L. I. Cothern, Jewell Ridge Coal Corp.

And For Your Information . . .

Big Majestic Collieries Tipple No. 2 was destroyed and the headhouse of Tipple No. 1 was damaged Feb. 13 when fire swept the buildings near Majestic, Ky. Loss was estimated at over $150,000. It was the second fire within 6 wk. Both fires are believed to have been set by arsonists.

A. T. Massie Co. is reported to be investing $4,500,000 in three mines being developed in Fayette County, W. Va. The company expects to produce 3,000 tpd from the Fire Creek seam; 1,000 from the Sewell seam. A cleaning plant is scheduled for completion in August.

Employees of West Kentucky Coal Co., Madisonville, Ky., long a leading non-union producer in a predominantly non-union field, were scheduled to become members of UMWA March 1, following earlier signing of a company-UMWA contract.

A bill to legalize use of black powder and dynamite underground has been introduced in the Kentucky legislature by Rep. James Treadway. The bill would repeal a section of the new state safety law, passed in 1952.

The Colorado legislature has repealed a 1937 law that required all state-owned buildings to burn coal. Opponents of the repeal argued the law would help employment in the state's mines. Proponents pointed to abundant, cheap supplies of natural gas.

Progressive Mine Workers of America has reduced monthly pensions to retired miners from $100 to $50, effective March 1. Disability benefits and grants to widows also have been cut because of decreased revenues to the welfare fund.

Crow's Nest Pass Coal Co., Ltd., has put into operation its new briquetting plant at Michel, B. C. Plant output of 60 tpd is earmarked for railroads.

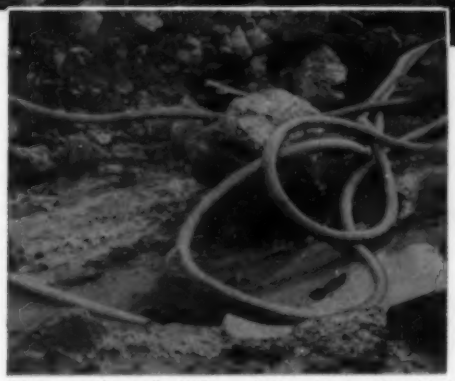
The Norton Mine, Norton, W. Va., formerly owned by West Virginia Coal & Coke Corp., has been bought and is being operated by C. E. Hough. The mine produces about 1,300 tpd from the Kittanning seam. West Virginia Coal & Coke Corp. will market the output.

Angas Corp., a subsidiary of seven anthracite companies, was expected to begin drilling for oil and gas near Sunbury, Pa., before the end of February. The leased area totals 4,000 acres.

Pennsylvania Coal & Coke Corp. has re-opened its Ehrenfeld Mine No. 3, in Cambria County, Pa., after a 10-mo shutdown.

H. Clay Stickel has begun mining operations at Golden Lee mine, Webster County, W. Va.; Taylor mine, Garrett County, Md.; and Troy No. 10 mine, Somerset County, Pa. Mr. Stickel's headquarters have been set up at Somerset, Pa.





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Kentucky Adopts Strip Law

Both houses of the Kentucky legislature have passed a bill to regulate strip mining in that state. The bill has been sent to Gov. Wetherby who, having endorsed the measure, was expected to sign it into law. The law will be administered by a new Strip Mining & Reclamation Commission. Beginning July 1, stripping operators will be required to obtain a state permit, for which they will be charged a basic $50 fee plus $10 for each acre of land affected by their operations. In addition, they must post bond of $100 to $250 per acre to guarantee restoration of the land.

Shovel Blasted As Mine Owners Seek End to Property Damage

Another dynamite blast in western Pennsylvania Jan. 23 destroyed a $12,000 shovel at a mine operated by Albert Stefkovich, near Avella, 20 mi west of Washington, Pa. State police said a box of 8-in sticks was tied to the shovel and set off after dark. The explosion was the latest in a series of 29 set off at Pennsylvania strip mines in the past 3 yr, with damages said to total upwards of $500,000. No arrests have been made in any of the incidents. Meanwhile, with the Central Pennsylvania Open Pit Mining Association offering a reward of $15,000 for information leading to detection of the vandals, advertisements have appeared in local and regional newspapers for "able-bodied young men of training and character" to apply for guard and patrol duty. Reports now put the number of men screened and employed for this duty at 25.

Mine Firm Wins Verdict

A Federal District Court jury Feb. 5 awarded $150,000 in actual damages and an additional $50,000 in punitive damages to Laurel Gap Coal Co., Dickenson County, Virginia, in a suit brought by the company against the UMWA and District 28 of the union. The company had asked for $150,000 punitive damages. The suit against the union alleged that the UMWA and District 28, by threatening a strike against Clinchfield Coal Corp., had forced Clinchfield to cancel a lease held by Laurel Gap Coal Co., which sold most of its production back to Clinchfield. The suit was brought under the Taft-Hartley Act.

MEETINGS

Bituminous Coal Research, Inc.: Annual Meeting, March 24, Neil House, Columbus Ohio.

American Society of Lubrication Engineers: Annual Meeting and Exhibit, April 5-7, Cincinnati.

Indiana Coal Mining Institute, Spring meeting, Hotel Deming, Terre Haute, Ind., April 10.

AMC, Coal Div.: Annual Meeting, May 3-5, Netherland Plaza Hotel, Cincinnati.

Pennsylvania Society of Professional Engineers: Annual State Convention, May 7-8, Bedford Springs Hotel, Bedford, Pa. Information from: L. F. Tierney, 301 Pine St., Hollidaysburg, Pa.

Southern Appalachian Industrial Exhibit, May 26-28, Bluefield, W. Va.





WINNING MINE (left photo)—Julius F. Howell, assistant superintendent, No. 17 mine, accepts trophy for safest Red Jacket mine from James Westfield, USBM. Others are: W. M. Ritter (left front), and J. J. Plasky (left rear), Red Jacket president and safety director, respectively; A. F. Cook, retiring superintendent; W. H. Tomlinson, USBM; and C. H. Williams, chief engineer. **TOP-HONOR FOREMAN** (right photo)—Norman Presley (right), Keen Mountain mine, accepts award for 7 yr of supervision without a lost-time accident from Harry Gandy Jr., National Coal Association.

Red Jacket Marks Safety High

Red Jacket Coal Corp. Jan. 23 paid top honors to 95 foremen who played leading roles in setting a new safety high of 3,567,817 tons per fatality in 1953.

Star foreman was Norman Presley, Keen Mountain mine, who supervised a Joy section that has produced 134,452 tons in 7 yr without a lost-time accident. Star mine was No. 17, which in 1953 mined 54,634 tons per lost-time accident for a frequency rate of 15.61 and a severity rate of 0.41. No. 17 mine had only nine lost-time accidents, two of which involved only one man-day each.

Of the 95 foremen on the honor list, 57 supervised sections from which 1,495,532 tons was mined in 1953 without a lost-time accident. Including Mr. Presley, 11 foremen have run their sections for 4 yr or more without a lost-time accident, as follows:

Six years—**Leonard Skeens,** Keen Mountain mine; **T. E. Sizemore,** Wyoming mine; and **Don Shields,** Coal Mountain outside.

Five years—**W. H. Harlow** and **Curt Matney,** Keen Mountain; **Ira Bradford,** Wyoming; **Orville Godfrey,** Coal Mountain No. 12; and **H. B. Artis,** No. 17.

Four years—**Walter Asbury,** No. 17; **Herbert Williamson,** Mitchell Branch.

Joining William M. Ritter, Red Jacket president, and other company officials at the banquet celebrating the new safety record were: Harry Gandy Jr., Safety Div. manager, NCA; James Westfield, chief, Health & Safety Div., U. S. Bureau of Mines; W. H. Tomlinson, chief, Region VIII, USBM; J. B. Benson, director of safety, Southern Coal Producers' Association; Mack Davis, Washington, D. C., W. R. Park, Mt. Hope, W. Va., and J. T. Whalen, Pittsburgh, all representing USBM; and Fred Cook, now retiring as superintendent of the company's mines after 32 yr with Red Jacket.

COMPTON Model 36 Coal Auger



designed for { Maximum recovery ...at Minimum cost

The new Compton Model 36 Coal Auger is the answer to the demand for rapid, economical high wall recovery in small, narrow pits. Only 36 feet long and weighing approximately 25 T., the Model 36 includes all the design advantages of the other Compton Coal Augers.

- Convenient, accessible auger sections racked on the frame.
- Synchronized winches for handling auger sections.
- Hydraulically operated pilot pan eliminates spillage between machine and highwall.
- Elevating conveyor is integral part of machine.
- Hydraulically-controlled swiveling discharge chute permits uniform trimming of trucks.
- Hydraulic jack legs (with self-leveling pontoons for better floatation) allow drilling up to 160 feet without misalignment.
- Single or vertical overlapping holes can be drilled in varying coal seam thickness.

The Compton Model 36 Coal Auger paves the way to higher quality through selective mining! Up to 60 Tons per hour recovered in actual production tests! Plan today to expand your present or future developments with Compton Coal Augers.

(Write for details about other Compton Auger Models 42, 48 and 56.)

Model 36 SPECIFICATIONS

Length: 36 *feet* *Weight: Approx.* 25 *T.*
Carries eight 20 *ft. auger sections*
Required pit width: 38 *feet min.*
Power: 150 *hp Diesel engine*
Hydraulic Frame Jack Lift: 54 *inch*
Auger Diameters: 44 *inch to* 24 *inch*
Possible Drilling Depth: 160 *feet*



The Compton Cutting Head — non-clogging type with a built - in spider bearing assembly — increases production by drilling straighter holes with less frictional drag.

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THE 40-TON ATHEY PH20

designed for safe, economical hauling of 40-ton loads at 34 MPH!

Capacity	40 tons or 56 cu. yds.
Design	Bottom-dump
Operation	Hydraulic with cable take-up
Construction	Frameless, all-welded high-strength steel
Power	275 HP (ASME codes) Cat DW20 Tractor
Speeds	From 2.88 to 34 MPH
Tires	24 x 29-36 ply rock grip
Brakes	22" x 7" air brakes on each wheel
Dimensions, Trailer, length	31' 6½"
Trailer-tractor, length	45' 1¾"
Width	11' 2⅝"
Height	10' 10"
Tread	108"
Width required for non-stop turn	45'
Turning width, minimum	37' 6"
Clearance, Trailer door open	8"
Weight, Trailer, Approx. lbs.	25,500
Tractor, less attachments, Approx. lbs.	25,600
Distribution, Front	13.5%
Drive	41 %
Rear	45.5%



COAL HAUL·ER

The Athey PH20 Coal Hauler — the *only* completely new hauling unit for the coal industry. Athey's experience of over 30 years of trailer building gives you a coal hauler that can speed 40-ton loads at 34 MPH for thousands of trouble-free hours!

The PH20 teams with the Caterpillar® DW20 Tractor to cut operating costs to a new low. The trailer is built to make full use of the tractor's power and speed for top production with complete operator and equipment safety.

The PH20 has a frameless, all-welded construction that eliminates dead-weight and increases pay-load capacity. Weight is distributed to assure maximum traction from the big drive wheels.

The PH20 has been proving its worth at mines for many months. Your Athey-Caterpillar Dealer can show you the results of these tests and can give you full details on the PH20. Call on him — soon — or write direct for facts and figures on the new Athey PH20 Coal Hauler.

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LOADING . . . 23' x 11' hopper makes an easy target for fast-swinging shovel. Body is reinforced inside and out to withstand loading shocks. 9' 5" loading height permits use of many loading methods. PH20 can be easily interchanged with Cat Scrapers and Wagon, or other Athey Trailers.



HAULING . . . 10 speeds to 34 MPH offers a speed to match any haul road condition. All-welded "unitized" design reduces and absorbs torque and twist of high-speed hauling. Oversized air brakes give positive stopping ability with full load. Wide tread provides stability.



DUMPING . . . bottom-doors can be air-released for quick opening or can be gradually opened under hydraulic control. Mechanical lock secures door while loading and hauling. Clearances of doors allow hopper or stock-pile dumping.

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- ☐ Send literature and specifications.
- ☐ Have my dealer's representatives call to arrange a demonstration.

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Company.....
Address.....
City..... State.....

Personal Notes

W. W. Goldsmith has been elected president, The Elk Horn Coal Corp., succeeding **J. F. Caulfield,** who has resigned and is retiring from business. Mr. Goldsmith has been the primary receiver for the company's properties, as well as an ancillary receiver operating the properties in Kentucky, since 1940.

Henry W. Bauer, formerly executive assistant to the operating vice president and associated with the operating department, West Virginia Coal & Coke Corp. for many years, has been appointed district manager of the company's operations in Logan County, West Virginia.

Robert J. Blair, general superintendent, has been named vice president in charge of operations, The Black Diamond Coal Mining Co., Birmingham, Ala. Prior to his association with Black Diamond, Mr. Blair was assistant to the general superintendent of mines, DeBardeleben Coal Corp.

L. B. Crawford, secretary of the Pocahontas Fuel Co., Inc., Pocahontas, Va., has retired after 50 yr of service to the company and its predecessors. Mr. Crawford, who began his career in 1903 with Pocahontas Consolidated Coal Co., Inc., was the oldest employee in point of continuous service on the rolls of the company. **William H. Prentice,** company mine inspector since 1934, has retired after 59 yr of service in the coal industry. He was for 12 yr a West Virginia state mine inspector prior to his association with Pocahontas Fuel. **Louis Roncaglione,** superintendent at the Amonate (Va.) mine since 1933, has been transferred to succeed Mr. Prentice as company mine inspector. **Irwin M. Sampson,** formerly superintendent, Moss mine, Clinchfield Coal Corp., has succeeded Mr. Roncaglione as Amonate superintendent.



Lorado Advances Johnson

TIMOTHY L. JOHNSON has been appointed assistant superintendent of mines for the Lorado Coal Mining Co., Columbus, Ohio, according to an announcement last month by L. F. Workman, general manager of mines. Mr. Johnson attended Farragut College, Farragut, Idaho, and the University of Idaho, and has been actively engaged in the company's coal-mining operations in Logan County, West Virginia, since his release from military service.

H. D. Pinkney, superintendent, Allen mine, Colorado Fuel & Iron Corp., Weston, Colo., resigned last month to become executive vice president of the United Electric Coal Cos., Chicago. A gradute of West Virginia School of Mines, Mr. Pinkney has spent his entire career with C.F.&I. except for a period when he was in the mining business with his father. He joined the company in 1925 as an assistant engineer and held various positions, mostly as superintendent of various mines, including Crested Butte, Morley and Frederick.

Harry O. Zimmerman, chief engineer, has been named assistant to the manager of coal properties, Island Steel Co., Wheelwright, Ky., John T. Parker, manager of coal properties, announced last month. **Joseph Peraino,** formerly assistant chief engineer, was promoted to succeed Mr. Zimmerman as chief engineer. Mr. Zimmerman has been with Island Steel ever since it acquired the Kentucky property in 1930, and Mr. Peraino joined the company soon after his graduation from Lehigh University in 1936.

William Stapleton, formerly superintendent, Hendrix mine, Consolidation Coal Co. (Ky.), has joined the Clinchfield Coal Corp. as superintendent of the Moss mine, Clintwood, Dickenson County, Va.

Lloyd W. Ingles, superintendent, Frederick mine, Colorado Fuel & Iron Corp., has been appointed superintendent of the company's Allen mine, succeeding H. D. Pinkney, who resigned last month to join the the United Electric Coal Cos. **Frank C. Bennett,** superintendent, Morley mine, was named superintendent at Frederick, to replace Mr. Ingles. Mr. Bennett has been succeeded by **John W. Bodycomb,** formerly mining engineer at Pueblo.

Harry C. Ballman has been named executive secretary of the Air Pollution Control Association. In his new position, Mr. Ballman also is senior incumbent of the Air Purification Fellowship maintained by the association in the Mellon Institute. Since 1949 Mr. Ballman has been city smoke regulation engineer for Columbus, Ohio, and for 2 yr previously held a similar post in Richmond, Va. His first position after leaving the University of Cincinnati was with the industrial sales department of the Island Creek Coal Sales Co., with which he was associated for 12 yr.



Dodson LCN Vice President

C. MILLARD DODSON last month was elected executive vice president of the Lehigh Coal & Navigation Co., Philadelphia. Robert V. White, LCN president, and Mr. Dodson, are slated to be elected chairman of the board and president, respectively, at the organization meeting in April. Mr. Dodson, who has been president of Weston Dodson & Co., since 1946, has severed his connections with that organization. He has been a member of the board of managers of the Lehigh Coal & Navigation since December, 1952.

R. C. Collier last month was appointed superintendent of the Hendrix mine, Consolidation Coal Co. (Ky.), Deane, Ky., succeeding **Wm. Stapleton,** who resigned to join the Clinchfield Coal Corp., Dante, Va. Mr. Collier started with Consol of Ky. in 1927 and has worked at all its mines in various capacities from coal loader and brakeman on up. He was transferred from Mine 204 to Hendrix in 1949 and was mine foreman at that mine before his new appointment.

John E. Dodson, vice president, has been named president of Weston, Dodson & Co., Inc., Bethlehem, Pa., succeeding his brother, **C. Millard Dodson,** who resigned his connections with the Dodson organization to become executive vice president of the Lehigh Coal & Navigation Co., Inc.

Raymond E. Zimmerman last month joined the staff of the Paul Weir Co., Chicago, as a vice president of the organization. Election of **Paul Weir** as chairman of the board and **Clayton G. Ball** as president, also was announced by the company.

Ernest E. Finn, director, Smoke Prevention Clinic, Anthracite Institute, has joined the staff of Public Relations Managment Corp., as consulting engineer for the Anthracite Information Bureau, New York. From 1913 to 1916, Mr. Finn was

"Cleans up the job by itself"



BUILDING ROADS and stripping overburden make up the regular work of this powerful outfit owned by Knife River Coal Mining Co., at their Beulah, N. D. property. But here it is leveling an area for a new truck turn-around, one of the many other jobs the owners find for it.

"Big Red"—the INTERNATIONAL TD-24—saves a lot of blasting for Knife River Coal Mining Co. "and we haven't found a limit to the uses for it," says superintendent

Knife River uses its INTERNATIONAL TD-24 primarily for road building and stripping overburden near Beulah, N. D.

But the Big Red TD-24 does many other time-saving, work-saving jobs around the place.

"We haven't found the limit to the jobs the TD-24 can do around a mine," says Superintendent A. S. Kane. *"Stripping and road building are naturals for it. The smaller jobs we can do faster, and in rock we find that by putting the tractor in to dig out all it can, we save a lot of blasting.*

"Sometimes we don't do any blasting—the tractor cleans up the job by itself!"

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director of research and assistant sales and service manager for Lehigh Navigation Coal Co. He served the Anthracite Institute for more than 17 yr, working with municipal officials and private industry to eliminate air pollution. During World War II, Mr. Finn served as consultant to the USBM on fuel conservation.

Melden E. Volin, chief, mining division in Region II, has been appointed regional director of the Bureau of Mines Region V, with headquarters in Minneapolis, Minn., succeeding Paul T. Allsman, who was recently transferred to Knoxville, Tenn., as regional director of the Bureau's Region VII. Prior to joining the Bureau in 1939, Mr. Volin worked for several western m'n ng firms and for various federal agencies.

Obituaries

C. C. Ballard, 63, chief electrician for all mines of the New River Co., Mt. Hope, W. Va., died Jan. 23 in a Beckley, W. Va., hospital. Widely known through his membership in the Underground Power Committee of the American Mining Congress, Mr. Ballard had been associated with the New River Co. for 48 yr. He was also a prominent member of the New River & Winding Gulf Electrical & Mechanical Institute.

Dr. Ralph E. Brewer, 61, chemical engineer on coal research, Central Experiment Station, U. S. Bureau of Mines, Pittsburgh, died Jan. 27, following a short illness. A graduate of Simpson College, Purdue University and the University of Minnesota, Dr. Brewer joined the USBM in 1935, to do research on the plastic, agglutinating, agglomerating and swelling properties of coal, contributing comprehensive publications on these subjects.



JAMES H. HUGHES

James H. Hughes, 80, mine superintendent, American Coal Co., McComas, W. Va., from 1906 until his retirement in 1948, died Jan. 2 at his home in McComas, following a heart attack. Starting his mining career at the age of 16 with the Southwest Virginia Improvement Co., Pocahontas, Va., he later went to the anthracite fields in northeastern Pennsylvania and while working studied at the Wyoming Seminary in Kingston, for a period of 3 yr. Returning to the Pocahontas field, Mr. Hughes was instrumental in opening and developing several mines in that area.

Frank J. Hughes, 57, superintendent, Glogora Coal Co., Inc., Blue Pennant, W. Va., died Jan. 23, at his home in Blue Pennant, following a heart attack. After graduation from Rock Hill College, Ellicott City, Md., as a mining engineer in 1917, Mr. Hughes joined American Coal Co. as resident engineer for 4 yr. He was subsequently employed by the Consolidation Coal Co., Jenkins, Ky., and was a special engineer for the Blue Diamond Coal Co., Middlesboro, Ky. In 1929 he joined Glogora Coal Co. as superintendent, the position he held at the time of his death.



NEIL E. SALSICH

Neil E. Salsich, 70, vice president and director, Jeffrey Mfg. Co., Columbus, Ohio, died suddenly Feb. 2 in Bethlehem, Pa., where he was to have met with officials of the Bethlehem Steel Co. during the day. Widely known throughout the coal industry, Mr. Salsich became associated in 1903 with the Penna. Steel Co., Steelton, Pa., which was later absorbed by Bethlehem Steel. After 28 yr with those companies in various capacities, he joined Jeffrey in 1931 and had been a vice president and director since that date.

Frank X. T. Burke, 60, president of Timothy Burke, Inc., anthracite stripping contractors, died Feb. 9 in Mercy hospital, Scranton, Pa.

Conrad J. Neekamp, 72, active in eastern Kentucky coal fields for many years, died Feb. 9 at Catlettsburg, Ky. At various times during his career, Mr. Neekamp was secretary of the Ashland (Ky.) Chamber of Commerce, the Logan County Coal Operators' Association and the Big Sandy-Elkhorn Coal Operators' Association, and was active in promotion of the Big Sandy River navigation project.

Dr. Calvert C. Wright, 48, Professor and Chief of the Div. of Fuel Technology, Pennsylvania State College, State College, Pa., died suddenly Feb. 1 following a heart attack. A widely known authority on fuels, Dr. Wright was stricken while engaged in making a promotional movie for the Anthracite Institute.

EQUIPMENT APPROVALS

Six approvals of permissible equipment were issued by the U. S. Bureau of Mines in January, as follows:

Joy Mfg. Co. — Type X15017-20 pump; 5-hp motor, 550 v, AC; Approval 2-978A; Jan. 4.

Joy Mfg. Co. — Type 1BDZ-1GH bulldozer; four 25-hp motors, 220 and 440 v, AC; Approvals 2-979 and 2-979A; Jan. 4.

Joy Mfg. Co.—Type 1BDZ-1E bulldozer; two 25-hp motors, 250 v, DC; Approval 2-980; Jan. 5.

National Mine Service Co.—Type Joy Model 32E12 (Special) cable-reel shuttle car; four 4-hp motors, 250 v, DC; Approval 2-981; Jan. 13.

Joy Mfg. Co.—Type RE60-1E rib extractor; two 65-hp and one 15-hp motors, 250 v, DC; Approval 2-982; Jan. 22.

Mine Safety Appliances Co.—Type "Face Duster" rock-dust distributor; 1-hp motor, 220 v, AC; Approval 2-983; Jan. 25.

Laboratory Dedication To Mark Annual BCR Meet

The first research laboratory owned by the coal industry will be dedicated March 24 at Columbus, Ohio. The ceremonies, to be keynoted with a speech by Ohio Gov. Frank J. Lausche, will feature the annual meeting of Bituminous Coal Research, Inc., research agency of the bituminous industry. Inspection of the building and its facilities will follow the dedication.

Speakers for the all-day meeting include the following: Dr. J. A. Hutcheson, vice president and director of research, Westinghouse Electric Corp., who will speak on "Research in the Electrical Industry"; Dr. H. J. Rose, BCR vice president, "Research and Markets"; E. R. Kaiser, associate director of research, "Research for Industrial and Electric Utility Use of Coal"; J. R. Garvey, supervising engineer, "Residential, Agricultural and Small Commercial Markets"; and J. W. Igoe, director of information, "Uses of Market Research." In addition, Dr. A. A. Potter, BCR president, will present the annual BCR award for leadership in industry-sponsored research.

A Techno-Sales Conference, restricted to salesmen and engineers of BCR member companies, will be held March 23, the day before the annual meeting.

NOW BETTER THAN EVER!

the new, improved COALMASTER *drill bits*



Sizes:
1046.....1⅞"
1047.....2¼"
1048.....2½"

1 FORGED CUTTING BLADES

Greater tensile strength—for longer wear, fast cutting action.

2 REINFORCED PRONGS

More material where it is needed most. Minimum breakage, longer life.

Already famous for their fast-cutting, long-lasting performance at the blast hole, the Coalmaster 1046, 1047 and 1048 Drill Bits now offer you even greater value in these important new labor and material saving features . . . Plus, of course, all the other features that have already made Coalmaster Bits the favorites in so many mines: (1) Special-Analysis Heat Treated Steel, (2) Quick Replacement, (3) Scientific 2-Prong Spiral Design.

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Designed for the 365 Coalmaster Drill Head. Shanks adaptable to *all* auger types —or can be welded to any auger.

DRILLING COALMASTER TOOLS

CENTRAL MINE EQUIPMENT COMPANY

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Among the Manufacturers

Quaker Rubber Sales Heads

Quaker Rubber Corp., Div. of H. K. Porter Co., Philadelphia, has appointed A. M. Lowrey assistant general sales manager, Western Div. branches, and W. H. Van Buren, assistant general sales manager, Eastern Div. branches. Mr. Lowrey has been associated with Quaker Rubber for the past 13 yr, rising from assistant manager, Mechanical Goods Div., to his present position. Mr. Van Buren joined Quaker Rubber in 1945 and has been manager of belting sales.

Australian Firm to Make McNally Pittsburg Units

McNally Pittsburg Mfg. Corp., Pittsburg, Kan., has completed an engineering-manufacturing-sales agreement with A. E. Goodwin, Ltd., of New South Wales, Australia. According to the announcement, McNally Pittsburg coal-preparation equipment will be manufactured and sold by the Australian firm, which is located in the center of the active New South Wales coal-producing area.

Longyear Revises Sales Setup

The E. J. Longyear Co., Minneapolis, Minn., has announced several changes in its sales organization. Stewart G. Richmond has been named manager of the new sales office opened in December in New York City, which will be the headquarters for the newly created eastern sales zone. Walter R. Eastman has been named branch manager of the new sales office and warehouse opened last month at 1177 S. 2d West, Salt Lake City, Utah, serving as headquarters for the new western sales zone. A central sales zone, with offices in Minneapolis, has also been established, and is managed by John H. Bimson. Ray Luelf has joined the Longyear company as a field engineer for the Sales Div. Longyear also announced that Western Machinery Co., Spokane, Wash., will represent it in Idaho, eastern Washington, and western Montana, with Ed Oman of Wemco handling Longyear products and services in that area. Western Machinery Co., Denver, Colo., will represent Longyear in the state of Colorado, and George Setter will handle Longyear products and services. Ramsey-Eddy Mfg. Co., Tulsa, Okla., will represent Longyear in the states of Kansas and Oklahoma, with Bo Bardsley as agent. Longyear also announced the formation of a French company, Longyear et Cie, with headquarters in Paris, France, which will handle exclusive distribution of diamond products manufactured by the Paris factory of Christensen Diamond Products, Inc., of Salt Lake City, in all of Europe and North Africa.

Lerner Kensington Sales Head

Earl A. Lerner, formerly western mine representative, Pioneer Engineering Works, Inc., Minneapolis, Minn., has been named sales manager, Kensington Steel Co., Chicago, succeeding H. Monteith Albers, who was elected vice president. Both companies are subsidiaries of Poor & Co., Chicago. Mr. Lerner was previously with Kensington from 1922 to 1928, and prior to joining Pioneer in 1939, was with American Manganese Steel Co.

Office for Denver Equipment

Denver Equipment Co. has opened a new office in Salt Lake City, Utah, headed by J. G. Uzelac, manager of the Chicago office for the past several years. Keith Wick, formerly sales engineer in the Denver office, has taken over the Chicago territory.

Cockrell Heads MEMCO Sales

Magnetic Engineering & Mfg. Co., Clifton, N. J., has appointed Daniel J. Cockrell, export manager since 1952, sales manager of the company. Prior to joining MEMCO as assistant sales manager in 1951, Mr. Cockrell served as overseas branch manager, middle east region, United States Rubber Co., and also was associated with Hewitt-Robins, Inc.

Henderson Heads New Division

The Weatherhead Co., Cleveland, Ohio has appointed Lester J. Henderson, sales manager of the newly created Industrial Div., directing selling activity for the Weatherhead line of industrial products. The new division is the result of a plan which features a greatly expanded engineering service program available to all Weatherhead industrial accounts. Starting with Weatherhead in 1935 as an estimator in the Engineering Dept., Mr. Henderson has been sales manager of the Aviation Div. since 1950, a position he retains in addition to his new responsibilities.

Clark Equipment Erects Plant

Clark Equipment Co., Buchanan, Mich., has announced plans to erect a new plant on the outskirts of Benton Harbor, Mich. The 145,000-sq ft building, which is expected to be in operation before the end of 1954, will be located on a 100-acre tract, and will be used as an assembly plant for a new line of tractor shovels, and for the assembly of power shovels now made in the present Benton Harbor plant. The tractor shovels, to be marketed under the "Michigan" trade name, are the first new items of construction equipment developed by Clark since its acquisition of Michigan Power Shovel Co. last May, and will be assembled at Clark's plant in Buchanan until the new facility is completed.

Ludlow-Saylor Buys L.A. Firm

Ludlow-Saylor Wire Cloth Co., St. Louis, has acquired the assets of Star Wire Screen & Iron Works, Los Angeles, and will operate the 30-yr-old company under the name of Star Wire Screen & Iron Works, Inc., at 2515 San Fernando Rd. The addition of STARSTEEL abrasion-resistant screens to the Ludlow-Saylor line of wire cloths and screens assures Pacific Coast and Mountain States industries of prompt complete availability of all wire cloth and screen requirements, the company reports.

Link-Belt Advances Riley

Link-Belt Co., Chicago, has appointed John D. Riley district manager of its Cleveland, Ohio, office. Mr. Riley, with the company since 1934 and district manager at Link-Belt's Newark office for the past 5 yr, succeeds the late Paul Wheeler.

Dorr Moves Sales Officials

The Dorr Co., Stamford, Conn., has appointed William E. Smith assistant sales manager, with headquarters in Stamford. Glenn O. Wilson, previously manager of the Western Industrial Div. in Denver, has moved to Stamford to become manager of North American industrial sales and has been succeeded by William T. Marston. Since joining the company in 1924 in the engineering department, Mr. Smith filled varied posts, becoming assistant manager, North American sales, in 1948 and manager in 1953. Mr. Wilson joined the Dorr Co. in 1928, becoming manager of the Western Industrial Div. in 1948. Mr. Marston, prior to his association with the Dorr Co. in 1949, had had varied metallurgical experience in Canada with several mining companies.

Gorman-Rupp Adds District Head

Gorman-Rupp Co., Mansfield, Ohio, has appointed William S. Miller district representative in the midwestern states. He was formerly associated with the Forslund Pump & Machinery Corp.,

Prizes, Dinner Mark Consol Safety Record

Winning foremen who helped set a new company safety record in 1953 received gold watches, gold lapel buttons, gold watch fobs, suits of clothes, radios, luggage and other prizes as Consolidation Coal Co. (Ky.) honored their achievements at a dinner Jan. 23 at the Ridgefield Country Club, Kingsport, Tenn. With C. O. Tarleton, Consol president, acting as toastmaster, Safety Director M. E. Prunty revealed a new low of 7.5 lost-time accidents per million man-hours in 1953, against 7.9 in 1952. Other speakers were A. D. Sisk, chief, Kentucky Department of Mines & Minerals, Lexington, and George Perry, supervising inspector, Norton (Va.) Station, U. S. Bureau of Mines. Officials of Pittsburgh Consolidation Coal Co., the parent company, who attended the celebration were: G. A. Shoemaker, executive vice president, and D. L. McElroy and S. M. Cassidy, vice presidents, Pittsburgh; and Carl W. Clayton, vice president, western sales division of the company, Cincinnati.



USE THE CABLE THAT FITS THE JOB!

Toughness is an absolute requirement for long, uninterrupted service life in mining cables that are subjected to the severest of all operating conditions. Hazacord's Hazaprene ZBF sheath is designed to provide the greatest possible mechanical protection while maintaining the flexibility required by highly mobile equipment.

Hazard's new exclusive "Hex-Tite" construction prevents twisting of the insulation within the sheath, avoiding one of the most common causes of cable failure. In the Hex-Tite construction the insulation is hexagonally shaped, affording a twist-proof grip. Reinforcing cords woven over the insulation double lock the conductors in place. And the tough, flame-resistant Hazaprene ZBF sheath completely encases the conductors and holds them tight.

Your Hazard representative can furnish you with further details on Hazard mining cables or write Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.



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insulated cables

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VERSATILITY...

ARMSTRONG OFFERS THE GREATEST CHOICE OF AIR-BREAKING EQUIPMENT TO COAL OPERATORS

Now coal operators can *choose* the equipment best suited to their operation from the five types of Armstrong coal-breaking equipment offered by Olin Industries, Inc. Shooting approximately every thirteen seconds, Armstrong air-breaking equipment permits on-shift shooting with multiple falls per face per shift. All Armstrong equipment can be supplied with either permissible or non-permissible 50 HP motors for any voltage in either AC or DC. Motors on Armstrong equipment are direct drive . . . no V-belt troubles.



Stationary equipment is available to operators who prefer to have compressors above ground. Tubing connections allow deep operations with a minimum of air loss.



For mines with track, there is a track-mounted, self-tramming compressor that allows work right at the face. Power for the compressor and self-tramming feature supplied from the nearest outlet.



The rubber-tired, self-tramming compressor is the perfect answer to rapid and efficient air-breaking. Great mobility permits fast, safe shooting on shift.



If the self-tramming feature is not desired, there is a track-mounted semi-portable that can be moved by hand to the working area. This compressor has all of the features found in the self-tramming except the tramming drive.



Mines without track can still have Armstrong underground equipment. The semi-portable rubber-tired compressor is well adapted to such an operation. Easily operated, it offers all of the advantages of air-breaking at a lower cost.

Olin

EXPLOSIVES DIVISION

OLIN INDUSTRIES, INC.
EAST ALTON, ILLINOIS

Kansas City. In announcing Mr. Miller's appointment, the company reported that it is in the process of considerably expanding its sales operations and that the district representatives will coordinate sales and service activities of Gorman-Rupp through its national network of distributors.

Overton Made Brad Foote VP

Brad Foote Gear Works, Inc., Cicero, Ill., has elected Carl E. Overton vice president in charge of sales. Starting in the gear manufacturing business in 1922, he became associated with a leading gear manufacturer from 1938 to 1947, when he formed the Austin Tool Works. He joined the Brad Foote organization as a sales engineer in 1948, was made works manager and in 1950 became sales manager.

And For Your Information . . .

Joseph T. Ryerson & Son, Inc., Chicago, has appointed Robert L. Larson manager of the alloy-steel division. Manager of alloy-steel sales, Chicago plant, since 1950, Mr. Larson has been succeeded in that post by William P. Loehrer, formerly a representative in the alloy and stainless steel department.

The Baker Mfg. Co., Springfield, Ill., has named Bert M. Constant assistant sales manager, succeeding George D. Phares, who has been appointed works manager of the new Beardstown, Ill., plant, now under construction. Mr. Constant has been with Baker since 1941. The Beardstown plant will contain more than 40,000 sq ft for manufacturing of Baker snow plows and emergency bulldozer, grade-builder and other earth-moving equipment parts to augment the Springfield plant production.

Atlas Powder Co., Wilmington, Del., has announced three changes in its San Francisco explosives sales district. Eugene F. Daily has become district manager succeeding William T. Mahood, recalled to Wilmington in the contractors section of the explosives sales division. Harry E. Urben, with Atlas since 1920 and formerly of the Seattle office, has been named assistant manager of the district. John R. Nichols, salesman, Seattle district, has been appointed sales agent with headquarters in Spokane, Wash.

Carver Pump Co., Muscatine, Iowa, has announced that William Dowd, an authority on centrifugal-pump design, manufacture and application, has become associated with the company as a consultant. Mr. Dowd became chief engineer and vice president of the Dayton-Dowd Co., Quincy, Ill., in 1917, and since the sale of his company in 1945, has been active as a consultant in the pump field.

United States Steel Corp., Chicago, has named John L. Marshall assistant to general sales manager of American Steel & Wire's Cyclone fence department, Waukegan, Ill. Charles J. Kinman succeeds Mr. Marshall as assistant district sales manager, southwest district, Fort Worth, Tex.

Cleveland Rock Drill Div., Le Roi Co., Cleveland, Ohio, has appointed Joseph A. Bogan director of public relations. Mr. Bogan came to Cleveland Rock Drill from Bituminous Coal Research, Inc., where he was assistant to the vice president and director of research.

Association Activities

Indiana Coal Groups Combine

The consolidation of the Indiana Coal Operators' Association, the Coal Trade Association of Indiana and the Indiana Coal Producers' Association into a single organization known as the Indiana Coal Association, following concurrent meetings held Jan. 22, was announced by J. W. Morgan, president, Ayrshire Collieries Corp., Indianapolis, Ind., president of the new association. W. S. Webster, Walter Bledsoe & Co., Terre Haute, Ind., was named vice president. Members of the executive committee named were David Ingle, Jr., Ingle Coal Corp.; Charles N. Templeton, Linton-Summit Coal Co.; Henry P. Smith, Princeton Mining Co.; and T. C. Kelce, Sunlight Coal Co. Headquarters of the new association will be maintained at 632 Cherry St., Terre Haute, Ind.









COAL MEN ON THE JOB . . .

IMPERIAL COLLIERY CO., Burnwell, W. Va. (left photo): A. L. Clark (left), general superintendent; and Paul Lively, general mine foreman.

CONSOLIDATION COAL CO. (KY.), Div. of Pittsburgh Consolidation Coal Co., Jenkins, Ky. (right photo): P. F. Powell (left), manager; and E. T. Old, representative, Marshall Equipment Co., Huntington, W. Va.; with D. C. Duncan, superintendent of shop; and E. P. Auxier, supply manager, Consol.

EAGLE BRANCH COAL CO., Manchester, Ky.: Austin Rose (far left), owner; Mrs. Austin Rose, treasurer; A. H. Burkett, superintendent, No. 3 mine.

Eastern Coal Corporation

cuts tie costs



with Koppers Pressure-Creosoted Ties

Some years ago, in its mine at Stone, Kentucky, Eastern Coal Corporation installed Koppers Pressure-Creosoted Mine Ties and Trestle Timbers. By using these pressure-creosoted ties, instead of other material, annual maintenance and replacement costs have been cut appreciably. That is because pressure-creosoted ties last longer.

Creosote, forced under pressure deep into the wood cells, thoroughly protects Koppers Ties from decay and termite attack. They retain their strength for several decades.

Wherever wood takes a beating —and that's almost every place in a mine — it pays to use Koppers Pressure-Creosoted Lumber. For example, this safer, stronger wood is widely used in cribbing, lagging, car bottoms, trestles, trolley poles, timber sets, etc.

Let us send you our free booklet, "10 Proven Ways to Cut Mining Costs." Write for a copy today.

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WOOD PRESERVING DIVISION
PITTSBURGH 19, PENNSYLVANIA

KOPPERS PRESSURE-CREOSOTED WOOD

New Booklet Aids in Selling Anthracite for Small Plants

A new 36-p booklet describing the merits of anthracite and antracite-burning equipment recently was announced by Anthracite Information Bureau. The booklet was specially prepared for architects, consulting engineers and plant operators who are concerned with selection of heating equipment for schools, apartment houses, hospitals, greenhouses, churches and other similar buildings. The publication, entitled "Automatic Anthracite Heating for Commercial and Public Buildings," stresses low maintenance and labor costs, freedom from smoke, dependability of supply, comparative fuel costs and availability of equipment. Copies may be obtained upon request to Anthracite Information Bureau, 122 East 42nd St., New York 17, N. Y.

Fairmont Bureau Designs Typical Small Steam Plant

Fairmont Coal Bureau recently has published a new booklet setting up typical design and layout features for a highly efficient, low-cost small industrial steam plant. The booklet is aimed primarily at consulting engineers and manufacturers of power-plant equipment. Design of the plant, including two 60,000-lb-per-hour spreader-stoker boilers, seeks best coal utilization and reasonable capital investment, with such savings in engineering as to make the services of consulting engineers attractive. Similar designs will be prepared for other sizes of industrial steam plants, said Carl A. Marshall, managing director, Fairmont Coal Bureau, New York 17.

Coal to Share Spotlight At 3-Day Power Meet

Coal and coal utilization will play a strong role in subjects planned for discussion at the 16th Annual Meeting of the American Power Conference, March 24-26, at Chicago. The conference is sponsored by the Illinois Institute of Technology with 12 universities and 10 local and national engineering societies.

Subjects of special interest to coal men are as follows, according to the preliminary program:

March 24—

"Research and the Electric Power Industry," by J. E. Hobson, Stanford Research Institute; and W. A. Lewis, Illinois Institute of Technology.

"Cyclone-Furnace-Fired Boilers," by G. W. Kessler, Babcock & Wilcox Co.

"The Present and Future Status of the Fly-Ash Disposal Problem," by C. M. Weinheimer, The Detroit Edison Co.

"Open Hearth v Electric-Furnace Economics and Their Significance to the Power Industry," by D. D. Moore, Battelle Memorial Institute.

March 25—

"Economic Trends in the Use of Natural Gas," by Richard Gonzales, Humble Oil Co.

"Future of Coal in Power Generation,"



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by George Lamb, Pittsburgh Consolidation Coal Co.

"Nuclear Fuels for Power Generation," by W. F. Friend, Ebasco Services, Inc.

"The Gallatin Steam Plant of the Tennessee Valley Authority," by C. E. Blee and H. J. Petersen, TVA.

"The Economy of Large Generating Units," by H. P. Seelye and W. W. Brown, The Detroit Edison Co.

"Economic Factors Affecting Selection and Replacement of Power Plant Equipment," by G. J. Matchett, Illinois Institute of Technology.

"Hawthorne Power Plant Rehabilitation Economics," by C. E. Morrow and R. F. Born, Western Electric Co.

March 26—

"Economic Aspects of Various Types of Nuclear Reactors," by D. H. Loughridge, Northwestern Technological Institute.

"Problems of Operation of Nuclear Power Plants," by R. L. Doan, Phillips Petroleum Co.

"Steam v Diesel Power Plants," by S. K. Fosholt, Stanley Engineering Co.

"Gas Turbines for the Power Industry," by T. J. Putz, Westinghouse Electric Corp.

"New Power Cycle With Gas and Steam Turbines," by L. S. Gee, West Texas Utilities Co.

"Operating Experiences With a Multifuel Stoker-Fired Boiler," by G. G. Bachman, Omaha Public Power District.

"Industrial Operating Experience With Cyclone-Fired Boilers," by L. L. Moran, The Dow Chemical Co.

Further information may be obtained upon inquiry to E.R. Whitehead, secretary, American Power Conference, Illinois Institute of Technology, Chicago 16.

Correcting the Record

In the article describing the Itmann preparation plant of the Pocahontas Fuel Co., Inc. (*Coal Age*, October, 1953, pp. 88-96), the manufacturer of the stoker equipment firing the furnaces supplying hot flue gases to the fine-coal driers was incorrectly listed. The manufacturer should have been given as the Hoffman Combustion Engineering Co., Detroit, Mich. In addition to those in the Itmann plant, stokers of a similar design are being installed in Pocahontas Fuel's Amonate and Bishop plants, the manufacturer reports.

New Books for Coal Men

Water: Threat to Anthracite

Mine Pumping Plants, Anthracite Region of Pennsylvania, by S. H. Ash, C. S. Hower, D. O. Kennedy and W. H. Lesser. Without early action to rid the region of excess water, the anthracite industry faces early curtailment and even extinction. Since existing pumping and drainage facilities are inadequate, the Bureau recommends a drainage tunnel like the proposed Conowingo system. *USBM, Bulletin 531. $1, Supt. of Documents, Government Printing Office, Washington 25, D. C.*

The Mining Might of Manitowoc 4500

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Look at Manitowoc's features that mean bigger yardage on every job — smooth, positive-action torque converter; fast operating cycles; special design long-reaching booms; hi-lift shovels; crawler-type mounting for faster traveling over all kinds of grades up to 30%; complete diesel operation which permits traveling anywhere without a trailing cable or electric supply; wide pads and wide crawlers that result in far lower ground pressure.

See the Manitowoc before you buy your next shovel or dragline — see for yourself why the big swing is to mighty Manitowoc.

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No gears, but all the advantages and none of the disadvantages of automatic, multi-speed transmissions. An infinite number of speeds at your command without shifting, since speeds and power are automatically balanced at all times.



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Short-Delay Blasting

Experiments in Short-Delay Blasting in the Experimental Coal Mine, by Irving Hartmann and Bernard Lewis. Although the Bureau does not give official approval to multiple short-delay blasting underground, tests show that this method can be used as safely as single-shot blasting if permissible charges are properly loaded, stemmed and fired. *R. I. 5026. 6 pp. 8x10½-in.; paper; mimeo. Free, Publications Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa.*

Cleaning Coal in Germany

Aufbereitung bergbaulicher Rohstoffe (Preparation of Minerals), Vol. I: General Preparation, Processes and Machines, by Helmut Kirschberg. An exhaustive and up-to-date account of crushing, wet and dry cleaning, heavy media, froth flotation and other processes, plus descriptions of equipment, formulas and tables. Written in German; translation not available. *425 pp. 6¼x8⅛ in.; cloth. Price: 19 Deutches-Marks ($4.52), Wilhelm Gronau Verlag, Jena, Germany.*

How TVA Is Growing

Annual Report of the Tennessee Valley Authority, 1953. With TVA growing, emphasis is shifting to coal-fired steam plants and big coal tonnages. Chapters on construction progress and power system operations are of special interest to coal men. *81 plus 89 pp. 6x9-in.; paper. 65c, Supt. of Documents, Government Printing Office, Washington 25, D. C.*

What Causes Subsidence

Mining Subsidence and Ground Control, by Dr. G. J. A. Grond. The author, chief surveyor of Dutch State Mines and professor at University of Delft, summarizes results of over 75 yr of study of strata movements by various authorities and over 25 yr of his own investigations. *57 pp. 7¼x9½-in; paper. 10 shillings, sixpence ($1.50), postpaid, Department of Mining, University of Leeds, Leeds 2, England.*

Other Books and Booklets

Human Relations Training Films: "A Gray Day for O'Grady" (3-film set on safety), "Fragile—Handle Feelings With Care" (respect for workers' feelings), "Call 'Em on the Carpet" (correcting workers' faults) and "It's an Order" (issuing instructions). Each film, 12 min. 16- and 35-mm; sound. Prices upon inquiry to National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

Showmanship in Safety. $1.25 to members; $2.50 to non-members. National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

Proceedings of the Third Biennial Briquetting Conference. Information Circular No. 6, Natural Resources Research Institute, University of Wyoming, Laramie, Wyo. No price quoted.

The following publications by the Bureau of Mines are available free upon request to Publications Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa. All are 8x10½-in; paper; mimeo.

Report of Research and Technologic



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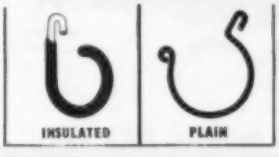
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are economical and time-saving—suitable for either side wall or roof suspensions. Just drive a Spad—clip on a hanger—and you have a quick, sturdy installation for pipe, hose or cable. Extra high tensile strength—ample for the most demanding installations.

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Specify American Spad Hangers, Plain or Insulated, for Quality and Economy. Plain—available in two styles: Lock Type and Open Type.



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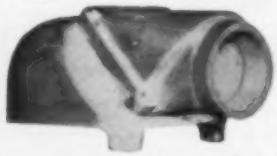
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LOGAN W. VA.

Work on Explosives, Explosions and Flames, Fiscal Years 1951 and 1952, by Bernard Lewis. R. I. 5006. 66 pp.

Distillation Assays of Missouri River Basin Coals, by Manuel Gomez and J. B. Goodman. R. I. 5009. 9 pp.

Preparation Facilities

Alabama By-Products Corp., Maxine Mine, Maxine, Ala.—Contract closed with Western Machinery Co. for Wemco 5C Mobil Mill with 18-ft Wemco cone separator for new washer; the new Wemco heavy media plant to ultimately handle 300 tph of 3x¼ coal, with approximately 70% of feed to the Mobil Mill to be clean coal; of the 300-tph total plant feed, remaining 200 tph of minus ¼ in to be cleaned by tabling.

Pocahontas Fuel Co., Inc., Mine No. 33-34, Bishop, Va.—Shipment by Deister Concentrator Co. of 24 SuperDuty Diagonal-Deck No. 7 coal-washing tables for cleaning ¼x0.

Royalty Smokeless Coal Co., Landisburg, W. Va.—Contract closed with Jeffrey Mfg. Co. for one 3-compartment 8-cell air-operated jig; capacity, 350 tph of 3/4x0.

Buchanan County Coal Co., Big Rock, Va.—Contract closed with Jeffrey Mfg. Co. for No. 200 unit washery; capacity, 140 tph of 6x½.

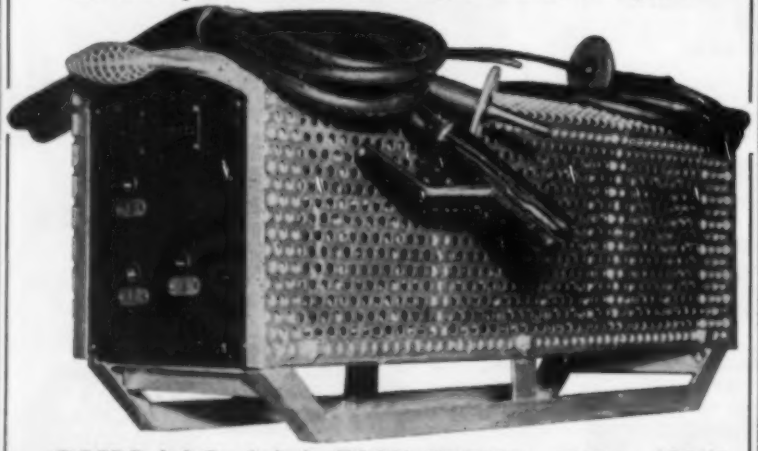
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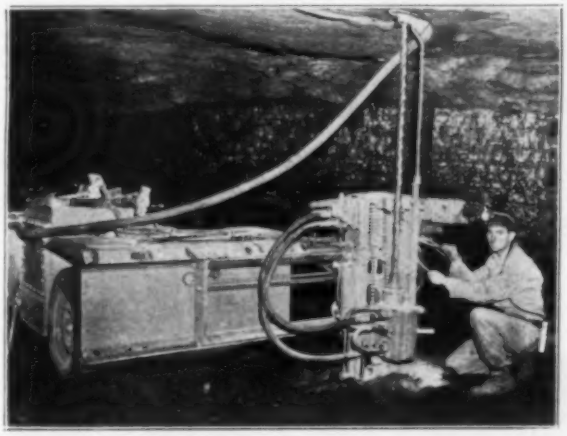
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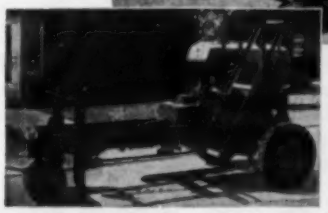
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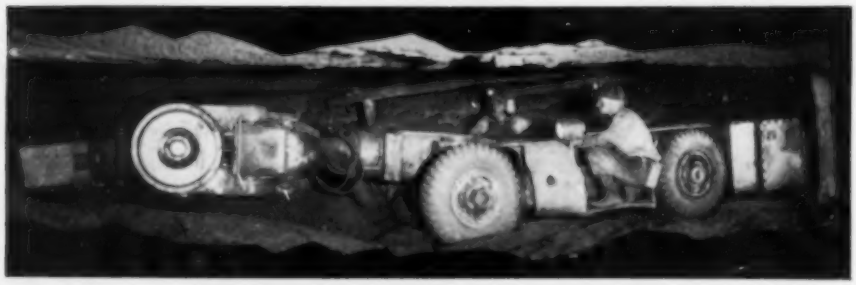


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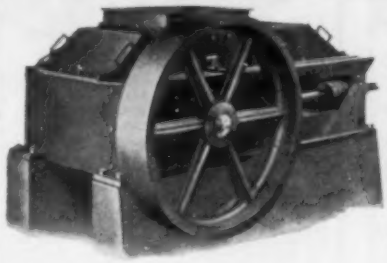
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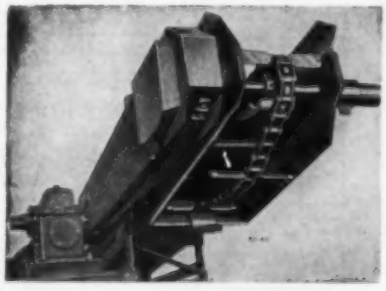
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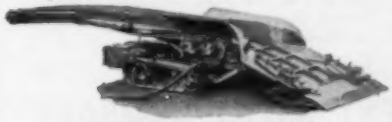
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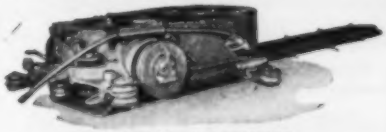
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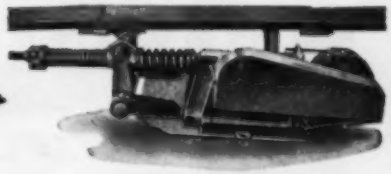
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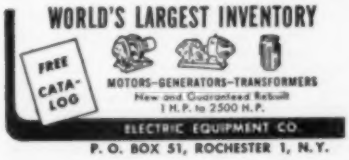
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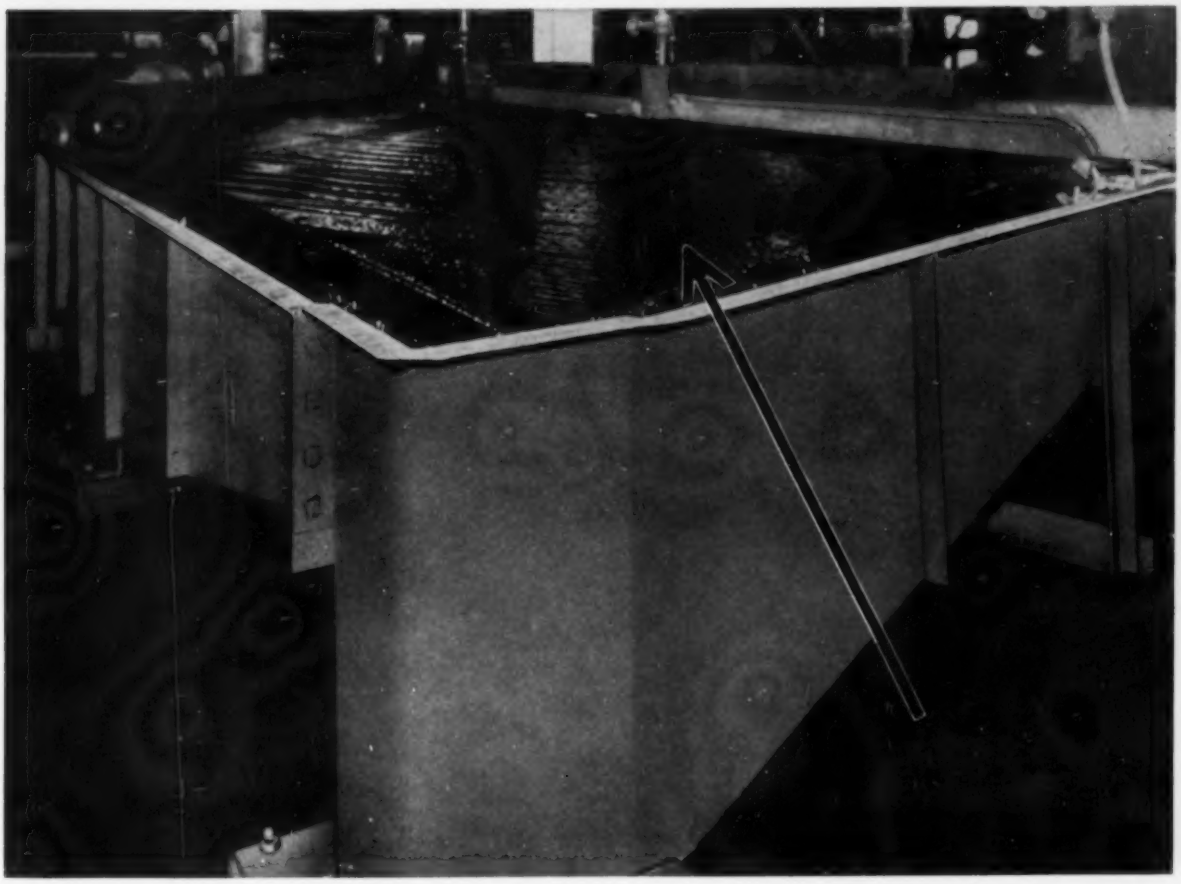
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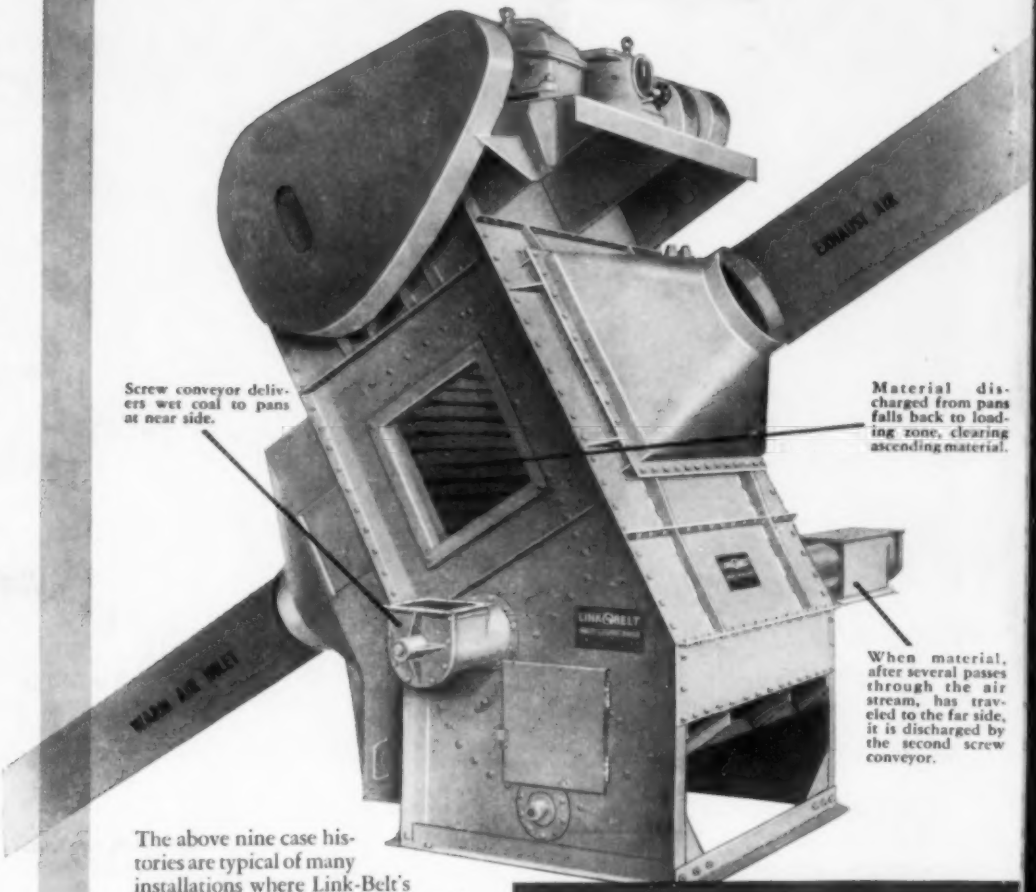
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No. 6 Seam

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No. 11 Seam

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No. 6 Seam

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